PRINTED ON

ARISTO-PLATINO.

NEGATIVE MADE THROUGH STRAUSS STIPPLE PLATE.

THIS PLATE OBVIATES THE NECESSITY FOR RETOUCHING, PRESERVING AT THE SAME TIME ALL THE CHARACTER IN THE FACE.

Internation

Anthony's,

Photographic

rican Process

The International Annual
of
Anthony's
Photographic Bulletin
and
American Process Year-Book

VOLUME IX., FOR 1897

Edited by

FREDERICK J. HARRISON

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PREFACE.

The past year has witnessed an extension of the applications of photography that promises well for the future. The discovery of Radiography, the projection on the screen of animated photographs, and the earnest efforts made in the direction of photography in colors, have attracted to our art-science many students of chemistry and physics, whose presence must sooner or later result in still more remarkable achievements.

The art side of photography has been stimulated by earnest workers, and the literature on the subject has received due attention.

This volume of the "International Annual" will serve as a partial record of the progress made during the past year, and, in its extended form, will show to what state of perfection photo-reproduction by the half-tone process has been carried.

Such a volume is impossible without the earnest assistance of many workers. This assistance, never heretofore lacking, has been this year enthusiastically rendered, making the editor's work comparatively easy. My most hearty thanks are tendered to all who have helped in making the Ninth Volume of the "International Annual" worthily representative of photography.

FREDERICK J. HARRISON.

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INTERNATIONAL ANNUAL

OF

Anthony's Photographic Bulletin

AND

AMERICAN PROCESS YEAR-BOOK.

1897.

EVOLUTION IN PHOTOGRAPHY.

BY MANLY MILES, LANSING, MICH.

THE recent progress in photography is rapidly effacing the lines that formerly distinguished the amateur from the professional photographer. The so-called amateurs, who were not practising the art for pecuniary ends, were assumed to occupy a lower plane, but they have taken the lead in its development, and many of them have become specialists in various lines of scientific and artistic work, entirely outside of the limited range of what were known as professional aims and methods.

The extension of photographic processes to almost every department of research, and the application of numerous improved methods in the arts, have been brought about by amateurs who intelligently adapted the available means to some definite purpose without reference to business considerations.

Photography is now recognized as an essential means of recording observations with an accuracy and minuteness of detail that could not otherwise be secured, and the errors arising from the personal equations that have been so difficult to deal with are entirely eliminated.

It is not my purpose to review the various steps of progress in the evolution of photography, but to call attention to some of the landmarks that indicate the general direction in which progress is being made.

The transition from wet to dry plates not only simplified the routine of manipulations, but made the art available under conditions and in directions that were not deemed possible under former methods, and its applications were extended in many ways, especially where long exposures were required even with rapid plates. With every step in the march of progress, the tendency to specialization in the practice of the art has increased, with a corresponding gain in skilful adaptations in particular methods.

A notable advance has also been made in attention to artistic requirements and conditions, and photography is now gaining recognition as one of the fine arts, with a growing appreciation, on the part of the masses, of progress in this direction.

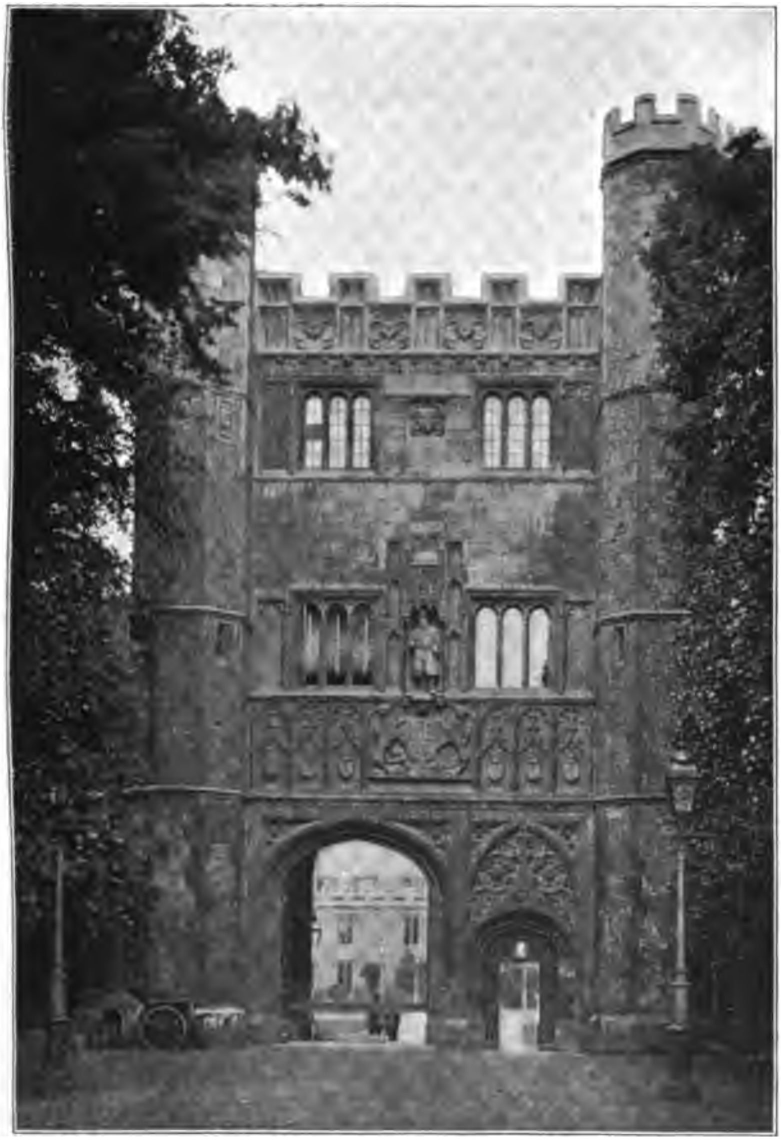
Color photography and the new field opened by the discovery of the X rays are receiving the critical attention of experts, and the future development of these special lines must largely depend upon researches for the advancement of science. The behavior of the ether, and the particular modes of motion it takes on under different conditions, and the dynamical relations of these various activities to the physiology of vision are the factors involved in the photographic problems we are interested in solving.

From the wide range of knowledge required to gain the highest measure of success in the practice and progressive development of the art, photography is entitled to rank with the learned professions, and schools of photography and the valuable photographic literature of the day are encouraging indications of an appreciative recognition of the means of future progress.

DE GRANTÆ PHOTOGRAPHIA.

By Reginald A. R. Bennett, M.A. (Oxon.).

IN last year's ANNUAL I wrote a descriptive article on the best way to utilize time when anyone is good enough to favor my own University with a visit, with intent to thereby add to his stock of negatives. This year I propose to do a similar office for those who are minded to include the "sister" University in their programme, or to visit that, for some personal reason, instead of Oxford.



R. A R. Bennett.

ENTRANCE TO TRINITY COLLEGE, CAMBRIDGE—THE GREAT GATE.

Now, as a matter of fact, if anyone has only time to attack one of them, I should recommend Oxford, not only because I think there are more objects of a striking nature to be done here, but because the photography is easier, from the simple fact (which is quite independent of any personal bias!) that our streets happen to be considerably broader than those at Cambridge, and therefore there are more things that can be done, and can be done quicker, than at Cambridge. But I most decidedly advise anyone who wants to get some lovely subjects, and who has the requisite time, not on any account to omit the sister University, as its glories are of a most unquestionable kind. It is perfectly true that the Oxonian can tell the Cambridge man that "your University does not contain so many beauties as ours does," but it is open to the Cantab to retort (and it would be equally true) that "there is nothing in your University that can come up to some things in ours." So matters are about equal, after all.

The first thing, I suppose, to be considered about any place which one wishes to visit, is the way to get there. Cambridge is reached by the Great Eastern Railway from London; also it can be got at by the Great Northern, and the North Western. There is, therefore, no difficulty in reaching it. The view of the town from the railway is not nearly so fine as the similar view from Oxford rail; this much, I think, both parties will admit.

The railway is some little distance from the town, and those who wish to use the means of locomotion of Nature's own providing, will have to make their way on foot to Trumpington Street, which is the nearest point of vantage. Here most of the colleges are situated, and I may incidentally remark that, just as at Oxford, permission must be obtained from the heads of these colleges before you will be allowed to take the photos for which you are desirous. As at Oxford, the titles vary according to the colleges, but there is a far greater unanimity at Cambridge, the following having special titles, namely—Cavendish, the Warden; King's, the Provost; Queen's, the President; Girton, the Mistress; Newnham, the Principal; Ridley Hall, the Principal; and the rest, without exception, are Masters, so there is no difficulty in recollecting them.

The road from the station is straight till you arrive at the new Roman Catholic Church, at which point you must turn down the street on your left, and presently turning to the right again will

bring you into Trumpington Street. The spire of the Roman Church is said to be a pretty accurate copy of the spire of the University Church at Oxford. A little way down the street we come to the Fitzwilliam Museum, opposite to which is the Addenbroke Hospital, which fulfils the double purpose of a County Infirmary and a Practising School for University men who are to be medical practitioners in the future, as does the Radcliffe Infirmary at Oxford. The Fitzwilliam Museum requires a wide-angle lens, and is best taken in the morning, from the top of the street of the same name over the way.

A little further up the street we come to what is considered to be the most ancient foundation in Cambridge, viz., St. Peter's College, commonly called the "Peterhouse." This is not a particularly easy building to take; it requires the morning light. The buildings are of a later date than those originally built. Close to this college stands the Church of St. Mary the Less. On the opposite side of the street, however, we have a much more interesting church, and the college next to it, in combination with it, makes a fine group. This is St. Botolph's Church and Corpus Christi College, to which it acted as a chapel till the year 1460. This group of buildings wants the afternoon light, probably about three o'clock. When the exterior has been taken, there is a very fine old quadrangle within, which is well worth a plate or two on account of the old mullioned windows, covered over with ivy, which are most picturesque. The photo requires the afternoon light, at any rate for the best part. The building nearly opposite the church (St. Botolph's) is the Pitt Press—the University Press, as the Clarendon Press is at Oxford. On the other side, between this and the Peterhouse, which face it, lies Pembroke College, the chapel of which was designed by Sir Christopher Wren, and built by his uncle. Almost every variety of architecture, both ancient and modern, is to be found in the quadrangle of this college, but however practically serviceable they may be, there are few of them of any merit as far as photography goes. Exactly opposite Corpus Christi College lies St. Catherine's College. This is only composed of three sides of a square, the fourth side being as yet uncompleted. There is not anything very picturesque about this; what is thought good enough to be taken may be done in the afternoon.

5

Passing down the street still further we come to another street, which is the finest street in the town by far, and rivals anything to be found of a similar kind in Oxford. This is King's Parade, and the college from which it gets its name is on the left-hand side. The street is simply crowded with splendid objects for the camera, which might be set up and used at almost every yard of its length. The *tout ensemble* is worth a plate or two, if taken rather higher up the street than the beginning of the "screen" bordering the King's ground; we get a vista of King's College, the Senate House, Gonville and Caius College, etc., and the grouping is very fine.

The college itself (King's) is certainly one of the chief beauties of the place. There are a number of beautiful subjects to be done here. One plate should be used on the screen, including the entrance gate. The tracery is lovely, contrasted with the green of the ivy clustering over it. Inside, a good view can be taken of the quadrangle, though it is too large to be satisfactorily got into the field of the camera except in bits. But the great glory of King's is its magnificent chapel, the west front of which, together with the adjacent buildings, forms a splendid object—certainly one of the most striking pictures I have ever seen in my photographic wanderings. Of course, when you are doing this piece of work you will be in that part of Cambridge which is denominated the "Backs," and which is well known from one end of England to the other for its beauty. They will afford you many a splendid picture for your camera.

We now return to the street, and just outside the entrance to King's is the entrance to Clare College, the quadrangle of which adjoins that of the former college. The quadrangle of this is worth a plate. It wants the afternoon light in summer, about 4 or 5 P.M., which also suits the west end of King's College Chapel and the Fellows' buildings adjoining it. The best part of Clare is, however, its bridge, which is in the "Backs" just beyond the King's ground. It is best taken in the morning, or early afternoon, from a meadow on the opposite side of the river, into which you can get from the King's College bridge.

Next to the King's College ground in front is a large and splendid building in which the degrees are conferred and examinations are held. Here the *magistri* of the University meet in solemn conclave to determine the laws and statutes of the Uni-

R. A. R. Bennett.

KING'S COLLEGE CHAPEL (WEST FRONT), CAMBRIDGE.

versity, and on occasion when some startling change is proposed (*e. g.*, the admission of women to the University degrees) the proceedings are very entertaining. This can be taken from the road, or from the grass in front of it.

Close alongside the Senate House, and at the end of the street, is Gonville and Caius College, which is always known as "Caius" (pronounced "Keys"). The front of this will make a good picture if you can get it in, but, owing to the extreme narrowness of the street, this is a hard thing to do. Inside there is a quadrangle which contains a gate known as the "Gate of Honor" which is worth a plate. This wants the morning light.

The street, which has been really the same all the time, now again changes its name, becoming Trinity Street, taking its fresh title from the college which is, undoubtedly, the largest foundation either in Oxford or Cambridge. This extends on both sides of the road, and is so large that it is divided into three parts, and the members are known as the "First, Second, or Third Trinity," respectively. In the quadrangle here there are innumerable subjects for the camera, but it is so large that it is not possible to get a fair idea of it into one plate, so it will be necessary to take it in parts. The great gateway makes a capital picture from the road outside, but here again the extreme narrowness of the street referred to at the beginning of this article comes in our way. If you have a wide-angle lens you must certainly take it to Cambridge. The time I found most suitable for this gateway was about 7 A.M. in July. Right through the great quadrangle we come to another, which goes by the name of "Neville's Court." The window of the hall makes a good subject, together with the adjacent buildings. This wants to be taken rather late in the afternoon. The late Duke of Clarence and Avondale's rooms were close to the window when he was at Cambridge, and loyal subjects of his grandmother can get them into the same picture!

Adjoining Trinity College is St. John's College—the second largest in the place. The front gateway of this is worth a plate, in which the end of the Chapel can be included. If a larger photo of the gateway alone is wanted, the only place from which to get it would be the grass plot belonging to the building opposite, which is the Divinity School. St. John's College is one of the most favorable specimens of the colleges which struck me most in my visit to Cambridge, on account of their dissimilarity

Interested.

Photograph by Rösch, St. Louis.
Engraved by
Geo. H. Benedict & Co.,
Chicago, Ill.

R. A. R. Bennett.

GREAT ST. MARY'S (UNIVERSITY CHURCH), FROM THE MARKET-PLACE, CAMBRIDGE.

to our Oxford Colleges, in being built of red brick. We have nothing of the kind (of great age) in the sister University. There are other examples of more ancient date in the place, which are even more picturesque.

All the colleges so far have been practically in one street. There are not an excessive number worthy of note in the other streets, but we must now consider these. However, before doing so, there are two things at the bottom of the old street worthy of a plate or two: these are the Round Church of St. Sepulchre and Magdalen College, which is down the street on the left (Magdalen Street). This is another building of red brick, and is pic-

R. A. R. Bennett.

TRINITY COLLEGE BRIDGE, CAMBRIDGE.

turesque in its way, though I do not think any part is worthy of special mention. A photo can be taken inside the quadrangle to get the whole effect. Returning up Bridge Street, we come to Sidney Street, which takes its name from Sidney Sussex College, which is the latest of the mediæval colleges, dating from 1596. It has, however, been more or less renovated and patched up, too much to be worth a plate from the road. You can probably get leave from the Master to photograph from the garden on the other side, which is worth a plate. Close to this is Christ's College, the quadrangle of which may be thought worthy of a plate. Time for this about 5 P.M.

There are other colleges (*e. g.*, Newnham and Girton, etc.) which may appeal to different people, but I must not take up too much of the ANNUAL in describing any more. There is one subject which ought to be mentioned, namely, the University Church of St. Mary the Great. This is in King's Parade, opposite to King's College, from the grass in front of which it can very well be taken in the afternoon. From the market-place on the other side it also makes a capital picture. My own photo of this was taken about 8 A.M.

Of interiors the following may serve as a slight indication: The chapels of King's, Trinity, Peterhouse (the windows are gorgeous and will want isochromatic plates), and St. John's, and the halls of St. John's, King's, and Trinity.

The cloisters at Queen's are very old and picturesque. The bridges belonging to the colleges are all worthy of a plate, especially that of St. John's, which goes by the name of the "Bridge of Sighs," being supposed to resemble the similar one with that name at Venice. You can make a tour through the "Backs," and will find plenty of subjects without my drawing your attention to them.

This concludes my account of Cambridge, to which I hope I have done as full justice as the necessarily limited space which I can permit myself will allow. I can promise anyone a regular harvest who will go there picture-hunting, and think that in all probability he will return, if possible, on another occasion!

ON THE USE OF ORTHOCHROMATIC PLATES.

BY A. D. GUTHRIE.

THE advantages to be derived from the use of orthochromatic plates compared with those of ordinary bromide plates in landscape work is beyond question, and a great deal has already been written to this effect; but, notwithstanding, their intelligent use in this branch of photography is anything but general.

Considering how long orthochromatic photography has been a reality, and the working of it plainly described by so many of our leading workers, it seems surprising that so large a number of plate users continue to ignore the superior claims of the color

sensitive plate. Frequently workers using the orthochromatic plates are but faintly conscious of the increased power placed in their hands, and to some extent bring discredit on orthochromatic photography by their failure to utilize the additional advantages. A general impression regarding these plates seems to be that their great advantage is in the copying of oil-paintings, and that for landscape negatives the ordinary plate will yield the most pleasing result. Only a want of consideration of the most elementary principles of orthochromatic photography can account for such an erroneous conclusion, for a monochrome reproduction from an orthochromatic negative intelligently made should be infinitely superior to one from the ordinary plate as regards the rendering of visual light intensity. We have been satisfied so long with the interpretation of the ordinary plate that it requires quite an effort of the mind to get away from years of erroneous precedent and accept the truer rendering of the orthrochromatic plate.

The function of the screen in orthochromatic photography seems but ill-understood, and doubtless has proved a stumbling-block and caused many to delay adopting the use of these plates, and the question is frequently asked if they will work without a screen. It does not seem to be generally understood that the real and only use of the screen is to cut off when desirable a portion of the blue and violet rays, and thus prevent their too pronounced action on the plate. In ordinary landscape work it only occasionally happens that it is advisable to sacrifice these or any of the rays of light which help to make the picture. A view which is suitable for an ordinary is equally suitable for an orthochromatic plate, the only difference being that while it is equally sensitive to all the rays which act on the ordinary plate, it is at the same time more sensitive to those colors which, though visually the most brilliant, have the least effect upon ordinary gelatino-bromide ; in other words, the color sensitive plate sees colors which are nearly invisible to the ordinary plate. Hence it happens that, under certain conditions of light—as, for instance, when the yellow rays predominate, or when photographing certain colors—a color-corrected plate will prove much more rapid than an ordinary plate of the same normal speed in white light ; as for instance towards evening, as the sun gets lower and the light more yellow, the relative sensitiveness of the orthochromatic plate is much greater

than the ordinary. In such cases a screen would be quite superfluous and a positive disadvantage; but when there is any tendency to haze in the atmosphere, the use of a yellow screen is most essential in order to obtain a negative rendering fairly the amount of distance as seen by the eye.

After careful observation during the continuous use of orthochromatic plates under varied conditions, I find there is a distinct gain by using them, even without a screen; the greens and yellows are much better impressed than with the ordinary plate, and when clouds are present there is every chance of reproducing them in the finished negative.

Altogether, the range of tone and gradation in the orthochromatic plate seems better than in the ordinary one. To those workers who are at times dissatisfied with the results they obtain on ordinary plates, I would strongly recommend orthochromatic plates, which, besides possessing the many advantages already enumerated, show a decided freedom from tendency to halation under fairly trying conditions. For interiors, however, they should be backed.

Complaints are frequently made as to difficulty experienced in the development of these plates, but with a little care, a full exposure, and suitable developer, they are quite as manageable as the ordinary ones; a pyro-soda developer seems to be the most suitable, on the whole, ammonia having a great tendency to produce fog.

LANTERN EXHIBITIONS.

By Robert E. M. Bain.

THE successful exhibitor is he who by careful attention to details, in both lantern and lecture work, impresses his audience with the absence rather than the presence of the mechanical features of the entertainment. It is an old and trite saying, "What is worth doing at all, is worth doing well." This is especially applicable to lantern or stereopticon exhibitions. The pictures may be excellent and the operator proficient, but if the speaker reads his lecture from notes or uses the printed form so often supplied with sets of slides, the crown-

ing feature of the entertainment is lost, for the speaker must be in sympathetic touch with his hearers, impossible of attainment if his attention be riveted to his notes. Far better to have no lecture at all and to simply describe the pictures as they appear on the screen.

It is a great advantage, of course, to have been to the places illustrated, but even this is not necessary to a successful accomplishment, as it is within the reach of everyone to obtain books descriptive of all lands and places of interest, and by a careful study of the locality and people an extempore talk will be rendered doubly interesting.

If the pictures be those of foreign lands, study the habits of the people, their manners and methods, vehicles, modes of living and customs, and then go before your audience "loaded and primed" to speak intelligently, and if necessary answer questions relating to the subject.

A great and glaring fault of the average describer of lantern pictures is to announce the name of a slide of an unfamiliar subject and then stop for want of a little tact and information. Suppose as an example we have on the screen a "Statue of Marshal Ney" at Paris.

Well, what about Marshal Ney? Who was he? Look him up and tell us what he was, what he did, and who were his associates. We all know that Marshal Ney was one of Napoleon's generals, but we did not all know what he did, how he fought, and how he died; and this point is the keynote of our stereopticon entertainment. You may say that the entertainment is not worth the effort. Then forego it.

If your audience is not sufficiently interested to appreciate your efforts, they are not sufficiently appreciative to enjoy an exhibition, and I would postpone the "show" until an audience could be secured who would understand and enjoy the entertainment provided and thus make it a pronounced success.

Remember that fifty slides well described are worth one hundred or more rushed on the screen without further effort, and that the character of your entertainment depends, not on the number of pictures displayed, but upon the manner of their presentation to your audience.

ON PHOTOGRAPHING RUINS.

By Rev. T. Perkins, M.A., F.R.A.S.

RUINS of abbeys, churches, and castles are generally interesting; seldom indeed do we find the remains of such old buildings without some history of their own. The abbey has without doubt witnessed many a splendid procession and stately funeral of the dead who lie buried beneath the ruined monuments; possibly it may have been the scene of some event recorded in our national history; the castle has probably stood many a siege, and in any case each building has something to tell us of the mode of life of the churchman or noble who once dwelt within its walls. The hand of Time, moreover, has probably added many a picturesque touch to the building; the weathered stone, the moss and ivy which cling to the walls, the mellow color of the whole, all lend a charm to the scene; but when the photographer comes with his camera, it does not follow that he finds it easy to make a good picture from the materials before him.

It is generally far harder, strange though it may seem, to make a satisfactory picture of a ruined than of an unruined building. For unless the original builder was destitute of taste—a rare thing in mediæval times—the building as he left it was sure to have had some beauty, of fitness, at any rate, if not of form, and to look well from some point of view or other. There was generally some dominating feature, the abbey tower or the castle keep, which is the very thing that is needed in a picture; but it does not follow that the same can be found in the ruin; war, time, or the landowner in search of ready-hewn stone for building purposes, has not discriminated in the work of destruction; the unity of the whole is often lost, the dominating feature gone; an arch here and a doorway there, connected, if connected at all, only by some grassy mounds that mark the lines of the foundations, do not necessarily compose themselves pictorially; hence it often happens, if the photographer is aiming at *pictures*, that he brings his camera backs away with him charged with unexposed plates. Architectural details are, however, often worth taking, and a single doorway, or chancel arch, or shattered wall, provided the

lighting is good, will sometimes form a photograph not without pictorial merit. One of the saddest of things that can happen to a ruin—a thing that unfortunately does often happen when it chances to be in or near a town—is for the surrounding ground

Rev. T. Perkins.

CORFE CASTLE, DORSET, ENG.

to be laid out as a public pleasure-garden with trim flower-beds, seats, and iron railings. The photographer, therefore, who is in search of the picturesque and of materials for artistic photographs

will find such ruins as lie off the beaten track the most promising for his purpose. Many such are to be found in England—castles especially along the borders, and abbeys in many a remote valley well watered by the stream that provided the fish that was so important an article in the monk's diet. A list of even the most picturesque ruins, from a photographer's point of view, would occupy too much space, so I must content myself with giving two illustrative photographs of ruins in my own county of Dorset. The first of these is the keep of Corfe Castle, with some remains of the encircling inner wall with its towers, showing how fine a site the old-world builder chose for the stronghold with which he meant to overawe the Isle (so called) of Purbeck, a district, by-

Rev. T. Perkins.

ST. CATHARINE'S CHAPEL, ABBOTSBURY, ENG.

the-way, possessing much of interest for the photographer—chalk cliffs and outliers, the little port of Swanage, the Norman churches of Studland and of Worth, the weather-beaten, stone-roofed chapel on St. Aldhem's Head, bleak wind-swept hills, ragged heaths, and gorsey commons. The other is a singular stone-built chapel, with no woodwork in its construction save for the door, dating from the fifteenth century, standing on the summit of a lofty hill near Abbotsbury overlooking the Channel,

a building which served the double purpose of a beacon for sailors and a church wherein the sailor's wife might offer her prayers for the safe return of her husband who was in peril on the sea.

PRINTING IN CLOUDS.

By W. Cooper.

AN easy and simple way of doing this is the following, though the result will depend partly on your artistic taste.

Take two camel's-hair brushes, one partly stiff, the other larger and soft. Mix a little non-actinic color, say vermilion, or else rub the stiff brush on the cake of paint. Paint quickly on the GLASS side of the negative as nearly like clouds as you can, change brushes, and, taking the softer one, dab it on the painted clouds and soften off the edges, particularly the under side where they melt into the sky; hold the negative up to the light and examine

the effect; if not to your liking, all you have to do is to wipe off the paint and start again. By using different colors (or even different thicknesses of the one color), from blue, which lets the light through easily, to red or black, you can obtain the appearance of gray or fleecy-white clouds at will.

Very great care in softening off the edge of the color is not necessary; the light having to come through the thickness of the glass will, of itself, soften the outline. With weak negatives I have sometimes found it necessary to paint the clouds on a separate piece of clean glass, which is placed in the printing-frame in

W. Cooper.

ENGLISH COTTAGES.

front of the negative, but this may be overdone, and very cottony, wool-looking clouds be the result.

Your artistic taste must suggest shape of clouds, and their position will be governed by subject and time of day exposure was made, recollecting that from whatever direction the light is coming, this must be the hard side of the cloud, and a very few trials will show you what a variety of effects can be obtained by this very simple means.

If your sky is very dense you may require to mask the negative, and an easy way of doing this is to get a piece of *red* blotting-paper (the red being non-actinic), place it against the glass side of the negative and hold up to the light, then with a well-charged pen trace the outline, when the blotting-paper will easily separate at the line you have traced, and you will not have a very hard edge; but if in printing this shows too distinctly, cut a rather larger mask from the first and place it over it but slightly raised from it, as if vignetting. The printing must not be done in too strong a light.

"BETTER BE SAFE THAN SORRY."

By Abraham Bogardus.

THE most reliable workers in photography to-day are the men who have by intelligent application succeeded in mastering its details so completely as to be *sure* of uniform results. They know what they can produce, and never turn aside to experiment. If experiments are to be made they never make them during their regular practice. An experiment is a risk. A young man asked an old Long Island pilot whether he knew every rock and shoal in the sound. The answer was "No, I do not know ONE of them, I KNOW WHERE THE DEEP WATER IS." Knowing the right course, he never allowed his vessel with its precious cargo to swerve from the safe course or go where danger might be possible. The above does not mean that a man shall confine himself to a well-worn rut in photography and never attempt anything progressive, but it does mean that he shall not be tempted to leave a certainty to follow every will-o'-the-wisp held up for his admiration. It is wisdom to give

" Easter Morn."

Photograph by DANA.
Flat Half-Tone by
BINNER ENGRAVING CO.,
Chicago, Ill.

consideration to everything promising a betterment. It has required judgment, care, and caution, to decide on the merits of many of the so-called improvements from the days of the old daguerreotype. They are still needed. Many of the promised benefits are visionary, others are an absurdity on their face, and again, others are only visible to the imagination of the crazy inventor. It is well to "try all things and hold on to" such as are not too slippery. It is well to desire to improve, but it is not well to part with your money without warrant.

The world is full of grasping men who would make us pay for the air we breathe, charge us for looking at the moon, or tax us for seeing the sun rise or set.

There are exceptions, but generally men wearing long hair, and women with short hair, are the loudest advocates of visionary schemes; they represent some ite, ology, or ism, that is destined to transform this world into a bower of ease, make life an endless honeymoon, and supply you with money to burn. If they cannot induce you to invest in their scheme after plausible arguments, they resort to abuse and impudence. Some men are willing to bear a *reasonable* amount of the above, considering it wiser than it would be to invest in their schemes. It may not be *pleasant*, but it is CHEAPER.

Thanks to inventive genius, there is a multitude of good things within your reach that will add to your comfort and success. Be satisfied with these, use them intelligently, and do not reach after the unattainable as men are apt to do. Æsop's frog tried to size-up with the ox; he put too much strain on his buttons and went to pieces in the attempt. A dirt-pawing bull considers it his duty to stop a rushing locomotive. In such cases the bull is sure to lose his standing in the community, and the experiment results in an exhibit of tough beef on the stalls the next market day. Make full use of every faculty; be ambitious to reach the highest point you are capable of filling; do your best, and leave the impossible for egotism and vanity to flounder in.

On visiting a gallery of paintings, the practiced eye of the connoisseur can tell the work of a prominent artist without referring to the catalogue. There is an unmistakable style recognized in each of his paintings. It will be a happy day, when a practical photographer makes his work so uniform in execution that it can be recognized as his at a glance. The time will come when the

work of A—— will be so uniform that it will be known without looking at the name. The work of B——, different in style, will be as unmistakable. And again, the work of C——, differing entirely from either, will have a style of its own, and will be known by some peculiar excellence always present.

A constantly changing light, the unreliable qualities of some chemicals, and a varying temperature, all subject the photographer to many and sometimes unaccountable difficulties. It requires a master to surmount them all, and produce uniform and reliable work under all circumstances. He must be on the alert for liabilities, as well as possibilities, from conception to finish, if he would be safe.

THE PEDIGREE OF THE SLANT-LIGHT.

By Gustine L. Hurd.

IF any disciple of photography is disposed to be reminiscent, the subject of sky-lights affords a particularly inviting field ; for it seems to me there is no requisite for picture-making with the camera which has passed through so many unique stages, and about which there have been so many nonsensical theories advanced as this. To say that some of the earlier lights were fearfully and wonderfully constructed is stating it in very conservative language. I can remember when ambitious photographers, or, to speak more accurately, daguerreotypists, considered a cone light a *sine qua non*, and these monuments of folly rose skyward from many a city and village all over New England. Imagine one of them starting from the ceiling of the topmost story of a building, no matter how high the ceiling might be from the floor, with a circular base of say 8 feet, and extending perpendicularly into the air a distance of 15 or 20 feet, tapering in form and approximating a point at the top. Prof. Smilie, of the Smithsonian Institute, who is so zealous in securing whatever pertains to the method of working in those early days, should have a model of one of these lights. Bear in mind it was only the élite amongst the picture-makers that rejoiced in the possession of these expensive, up-to date pyramidal lights: the others got along with side windows or little flat sky-lights as befitted

their humble standing. Yet these great leaders were not entirely harmonious in their views on the subject, some contending that a four-sided pyramid was even better than a conical one, and the height and taper led to warm discussion. If any of our younger men never heard of these wonderful Lights, and desire to see one, they have only to call on that Rip Van Winkle of photographers, Mr. Hawes, Tremont Row, Boston. He has one of the four-sided variety which he will tell you he has made sittings under for fifty-four years.

Afterward some person of great scientific attainments discovered that a sash introduced at an angle of 45° in the roof afforded the only light by which artistic portraits could be made. This innovation was greeted with great enthusiasm, compared with which the interest in Slant-lights is nowhere. Photographers advertised that they had introduced to their galleries (these places were always galleries) a sky-light at an angle of 45°, and referred to the fact that scientific investigation had established that this was the exact angle at which light should fall upon the sitter. I remember that one irreverent fellow, heedless of the value of scientific research, sought to hold a rival who advertised thus up to ridicule, by securing space immediately underneath and stating that his sky-light was at an angle of 44½°.

As mankind sat upon stools for some centuries before anyone thought to add a back and convert it into a chair, so these 45° Sky-lights were in great favor for years until it dawned upon some bold thinker that to add a side-light would make a combination that, to use a slang phrase, would knock all previous lights silly. Thereafter those who did not have a top and side light were not considered in it. Such bold aggressions upon the usages of the Fathers led to great abandon of thought, and the air was full of the most kaleidoscopic theories on the subject of lights. Some advocated and used a Saddle-Light—dual sky- and side-light—and no end of discussion has arisen as to whether plain ground, cathedral, or other glass should be used. One ambitious man put in a light—sky and side—of plate glass, the panes running unbroken the whole length of the sash, say 12 feet, and perhaps 3 feet wide.

Another worthy had a top- and side-light of blue stained glass. I think that if all that has been published on the subject of

lights and how to curtain them could be collected in a volume, or say several volumes—for no one volume could contain it all—it would make what the late Mr. Greeley used to call " mighty entertaining reading." One would probably never have a chance to see so much nonsense together again.

And now we have the Slant-light, which we should have had all along, and which some have had—the latest baby in the Sky-light family. If it has no other advantages, it is true one avoids the sun in summer (if the right exposure is had), and the snows of winter cannot accumulate upon it. It seems idle to contend that large groups can be as well illuminated by it, and I suppose our best men will go on making good work under their old lights, regardless of the new star in the firmament. If one is very anxious to be " up to date," a simple and comparatively inexpensive device will, in many cases, nearly cover the ground. It could not be applied to a low flat light, but if the sky-light is of good height, and especially if it has quite a slant, and has a side-light in connection coming near the floor, a large frame, covered with such cloth as architects use for drawings, hinged under the side-light and carried up to include, say, two-thirds of the sky-light, will do surprisingly well. The balance of the sky-light can be screened by opaque shades.

THE SOLUTION.

By James Reüel Smith.

THIS refers not to any sort of liquid concoction, but to the happy solution, by means of the bicycle, of a problem in photography that has long vexed many devotees of Daguerre.

The wheel has made it possible to do work with a short focus lens that formerly could only be done at considerable expense by the purchase of a telephotographic lens, or of a horse, with a more or less complete vehicular outfit ranging from a saddle upward.

The atmosphere was becoming overcharged with the wail of Titus in many tones, or, if it was not " diem perdidi " that floated mournfully to the ear, it was the cry, on excursion, summer ramble, or where not, " If I only had my camera here," or the

James Reüel Smith.

IN A CITY PARK—THE BRONX.

still more doleful ending to some charming account of a journey, "O! if I could only have had my camera with me."

In the city everyone knew of or had read of unvisited localities a dozen miles away, where Nature or Time had made such rich endowments that it was only necessary to set a camera down anywhere, about five feet from the ground, and actuate the shutter and slides until the film was exhausted, in order to secure prize-winning pictures. And, in the country, weeks were spent within a few miles of picturesque spots without obtaining a memento of them because the way was long, or the days were hot, and the camera heavy.

But now "nous avons changé tout cela," or, if not, we ought to set about it at once, for we can say in paraphrase of Emerson, "My wheel puts me in instant touch with all the beauties for miles around."

It is as easy to strap a glass plate hand-camera to the handle-bar, and carry several dozen plates under the saddle, as it is to sling a small roll film instrument over the shoulder, and then, with a four-ounce vial and some dry developer and hypo previously weighed out into pockets, one is prepared for a week's trip; for a Twentieth-Century lamp with its extra red glass readily converts any country-house room into all that is needed. Or, the development can pleasurably be left for the winter months, the exposed plates being repacked in the boxes they were bought in.

When an exposure book is kept, it is handy to stick a gummed number to the back of each plate and write on the box the numbers it contains. Any desired picture can then at any time be picked out for development.

Printed and gummed numbers are sold in sheets at city stationery stores, but the rural camerist can make a year's supply in ten minutes.

In fine, the cycling camerist's wheel should no more be without its camera than without its lamp or its cyclometer.

SIMPLICITY IN PHOTOGRAPHY.

By W. J. Hickmott.

OUR constant aim and endeavor should be toward simplicity. Not how much can be crowded into a view, but how much can be left out, should always be uppermost in the mind, both in landscape and in portrait photography. The intent of the photographer, the idea which was in his thought, is often obscured, if not entirely hidden, by the complexity of the composition. In the mass composing the picture we are unable to find at once, if at all, what the operator intended to portray, and we fail to see in the result what was visible to him and what he endeavored to produce. This should not be. The motive should always be apparent, and the more readily we can see what the artist intended to convey, the greater the success of the picture will be. In landscape work, for instance, it is exceedingly difficult to get down to that point of simplicity which insures success. We have perhaps a beautiful meadow, with a meandering stream, and on the sides are wooded hills. The meadow is an ideal spot. In the afternoon light it lies before us as beautiful as a dream. The shadows from the trees on the hillside are thrown far across the waving grass, and we look upon it and call it perfect. We set up the camera, in exactly the spot where we stand, and where the view is so lovely, and when we look upon the ground glass our beautiful meadow has disappeared. We have not one picture; we have a dozen, two dozen, any number we want, but we cannot get our meadow alone, and we cannot get any of the rest of the pictures alone. They are all crowded in together in such a jumble that while several of them would be perfect in themselves, taken together none of them is good. Our lenses give us too much. A painter looks upon our meadow and he paints it, and he makes a beautiful picture, and a success. We cannot leave anything out, and so we fail. Our meadow is there, but when we look at it we cannot tell whether it was designed to portray the meadow, or the stream, or the wooded hills, or whether it was the intent to merely give a bird's-eye view, and so our photograph that was to be so lovely is unsatisfactory and worthless. Our remedy must lie in the use of lenses of a greater focal length and narrower angle. Of

course, with these we cannot do what the painter does, leave out what we wish, but we can do better than with the ordinary medium focus lenses. It may be that the tele-photo. lens will give us better effects, and the experiment is well worth trying.

In portraiture we have an opportunity to work on simpler lines, and the best artists of the country produce beautiful results with the fewest and simplest accessories. Elaborate backgrounds and heavy furniture should be used with extreme caution. The whole aim should be toward simplicity both in pose, lighting, and accessories, so that nothing whatever shall detract from the figure. This should always be the central thought, and nothing should be introduced to distract the attention, or leave the observer in doubt as to whether it was the intention of the artist to produce an interior or landscape with a figure, or a portrait with a landscape or interior attached. Simplicity in pose, in lighting, and in accessories—these are the things for which we should strive.

In landscapes we must of course take things more or less as we find them. We cannot move hills, or forests, or streams, but we can use care in the selection of our views, and we can find most exquisite things without going long distances from home. There are all about us lovely bits of scenery that perhaps we have seen many times without ever having given them a thought. They seem too small, too insignificant, but on the ground glass these small bits compose wonderfully well. We can get close to them. There is no great expanse of field and wood, but we get a picture, and in many cases the results are so good that we wonder how we ever came to overlook such a pretty scene. The trouble is that we do not know a good thing when we see it. We look for something grand, far-reaching, expansive, and awe-inspiring, forgetting, or not knowing, that such things cannot be reproduced in the camera and made to convey any idea whatever of the original. A mountain, thousands of feet in height, taken from a distance, and with a lens of ordinary focus, looks mean and insignificant, and it is almost an insult to its grandeur to photograph it at all. A broad stretch of meadow, with graceful elms scattered about, and lovely hills lying beyond, dwindles to a dreary waste into the further edge of which the hills that look so beautiful sink and disappear, their presence being indicated by a faint unevenness in the horizon line. There is no use in trying distant objects and views. They do not compose and make pictures. Confine the

Falstaff.

Photograph by B. J. FALK.
Engraved by
FRANKLIN ENGRAVING AND
ELECTROTYPING CO.,
341–351 Dearborn St., Chicago.

attention to a scrap of scene that in its entirety covers but a few square yards. The painter selects a few trees, a winding path with a clump of birches and a tangled mass of wild flowers, or a bend in the brook, the whole perhaps not more than fifty feet square, and he makes a picture say 17 x 20 in size, and he gets a picture. We set up our camera in the same spot and make say an 8 x 10 view, taking in the same thing, and what do we get? Our view takes in all that he got and perhaps 100 acres of field and woodland beside, and the precise spot that he has made to look so lovely on his canvas we pick out with difficulty from the mass constituting our photograph. We simply get a photograph, a record of the country, and not a picture. We rush blindly by pictures all about us in the mad search for something grand and imposing, and after we find it we cannot reproduce it. Perhaps right under our feet, or close at hand, there is something beautiful that we could photograph, and make a picture, but we never see that. We are looking for something big to fail upon, as fail we certainly will. We are not looking for simplicity; we want to do something we can't do. The things that we can and might do we neglect. It takes a long time to educate ourselves down to simple things.

DEVELOPING POCKET CAMERA FILMS.

BY ROBERT J. HILLIER, M.R.C.S., L.R.C.P.

TO those people who use pocket cameras or other cameras in which the films are not automatically perforated at each end of each picture the following suggestion may be of use:

Get a glass dish made about two inches deep by two inches wide and as long as the width of the film to be developed. About one inch from the bottom have a glass rod fixed parallel to the bottom surface and running the length of the dish. When developing do not divide the band of film anywhere, but have enough developing solution in the dish to just cover the glass rod, then pass one end of the film below the rod with the back of the film, of course, against the rod. By pulling the film backwards and forwards every part of it will come in turn in contact with the solution and will develop

very equally. The two ends of the film should, of course, be held up perpendicularly above the dish, so that the gelatine surface shall not be scratched by the edges of the dish. The principal advantage of this procedure is that it obviates the necessity of dividing the film before developing, a procedure which, despite the excellent instructions sent out by the Eastman Company, frequently gives rise to loss of good negatives through their accidental division. There is also the recommendation of rapidity of development when large numbers have to be dealt with, as one dozen negatives can be developed at once with the greatest ease.

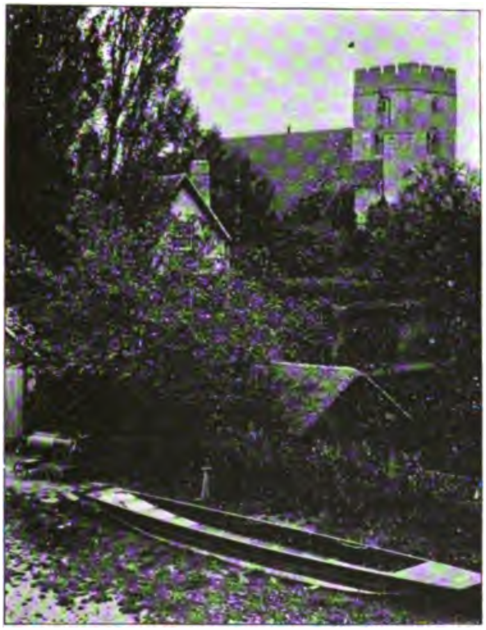
BERKS, BUCKS, AND OXON.

By S. E. Kelf.

"GREY DAYS AND GOLD," a charming and gossiping little work, written from Staten Island, New York, by an American visitor to this country, indicates the extreme delight the tourist from across the water takes in our ancient and historical country life. But many are unaware of the changes that are going on. Many of our villages are slowly but surely—if such a phrase is allowable—being "gobbled up" by our big towns. The villages decrease and the towns increase in population. We have only to remember that half the population of this country live in about sixty great cities or towns as large or larger than Reading, with populations of over 50,000, including London, which runs into millions.

We can easily see that our social life is changing. "Agriculture" is hampered in every direction. Every Parliament tries to grapple with it. But of course we cannot stand still, and so village industries are falling into desuetude, and the village cottage into decay. Then again in some places splendidly timbered estates, or even shady lanes, are being denuded, because the wood helps to keep the owner from sooner reaching the bankruptcy court. The changes come about so quickly that perhaps last season you noted down some pretty spot to get a

photograph of, and this season you cannot recognize the place. Instead of the beautiful walk by the river bank, you find it fenced off, or the place " laid out " for boating parties, with a galvanized inn shanty for a boat-letting business. The paths are diverted, and you must take for a little while the dusty road. You can perhaps look over the fence or high stone wall, and you may see notices with "trespassers will be prosecuted," "private," "beware of the dog," and such like deterrents. The high stone walls throw back an intolerable heat in hot summer weather, and not the smallest regard is paid for the welfare of the people. In most



S. E. Kelf.

GORING CHURCH.

of the attractive " upper reaches " of the Thames this old village life is growing extinct. The riverside resorts are getting quite metropolitanized with the advance of the pleasure seeker. Then "investment companies," or "builder capitalists," come along, and, much to the regret of the photographer and artist, the quaint inns and rustic cottages are pulled down, and fashionable hotels, genteel, suburban-looking, let-lodging-houses rise in their place.

Considering all these things, but more with a desire to get as much fresh air as possible in a very limited spare time away from business, I have been round two or three villages not far from home. Armed with a heavier apparatus, such as the too indolent "out-to-enjoy-themselves-art-by-machinery-men" would be frightened at, I have got a few prints which I trust Mr. Editor will reproduce. They have been secured either alone or in company with the members of our newly-formed University Extension College Camera Club—a club composed of students and past students. With the photographs I will give a rambling description, and trust it will be of some interest to our friends across the water.

S. E. Kelf.

ALDWORTH CHURCH, BERKS, ENG.

The first place I will mention is a visit to Aldworth in Berkshire. Going to a riverside station (Goring) nine miles from Reading and forty-five out of London, we leave the rail, and the place is so charming that most people stay there. We select Goring Church for our first photograph, and many pretty views can be got of it. The lock and surroundings have recently been modernized and laid out as before mentioned. So we pass over Streatley Bridge to the opposite side of the Thames River and secure Streatley

Mill. Leaving the pretty village of "Streatley" behind, with perhaps three or four camerists in sight, we pass up Streatley Hill. On a very warm day, with a heavy camera, the ascent of Streatley Hill is a thing to be remembered. We walk for about three miles in bracing air and cool wind—the wind always seems to blow up here, and photography, therefore, is rather difficult in consequence. We find ourselves at Aldworth Church.

S. E. Kelf.

ALDWORTH CHURCH.

Now about churches a venerable archdeacon lately wrote a paragraph which I must certainly not omit. He said: "The glories of church architecture are to be seen in our noble cathedrals and in our old parish churches of even the smallest village. These churches are uninjured and perfect, have come down through a hundred scenes of war and bloodshed. There is scarcely an inhabited house in England, except the old baronial castle, five hundred years old. But five hundred, eight hundred, one thousand, have passed over our churches unscathed. The wings of guardian angels seem to have sheltered them from human fury. English Churchman, they are yours to this day, and a noble inheritance they are." Notwithstanding these stirring words,

many churches and even cathedrals that I have visited always have some record of destruction in the Cromwellian age. Wanton injury has been done to some splendid effigies in Aldworth Church. It is said that in the time of Queen Elizabeth these effigies were noted, and that Queen Elizabeth herself came from Ewelme to inspect them. The effigies are of the De la Beche

S. E. Kelf.

YEW-TREE, ALDWORTH CHURCHYARD.

family; the single figure in the middle of the church is of Sir Nicholas de la Beche, Constable of the Tower of London, and tutor to the Black Prince. Most of the effigies are of knights in armor, and by certain records some went to the Crusades. Richly foliated arches or canopies cover most of the figures. Coming

outside we see a beautiful yew-tree—nine yards round—which is stated to be older than the church. It is hollow, and its days seem numbered.

Before we return we have a look at the well 230 feet deep, and almost dry in summer, and also take a cottage or two, the same family living there for generations. A village industry next, not quite extinct—hurdle-making; also the hurdle-makers' sisters at the gate opposite; wending your way home you meet a clump of firs. Gathering wild flowers on your return, and noticing over the "Berkshire downs" which stretch for miles, the "Roman road," now covered with grass, untrod, and leading to extinct cities, you think of the lines of Gray—

"Now fades the glimmering landscape on the sight,
And all the air a solemn stillness holds."

So that leads you to resolve to go as soon as possible to "Gray's Country."

S. E. Kelf.

MEMORIAL WINDOW AND GRAY'S TOMB.

Very soon after this, on our next half-holiday, we wandered into Soke Pogis, a little village in Bucks. This is in the direction

of London, and just mid-distant, about 20 miles west from London and east from Reading. But we did not go exactly that way. Visitors to Henley or Maidenhead will find it a nice drive into Stoke Pogis and return by way of the fine old forest of "Burnham Beeches." The vicar of Stoke Pogis met us—members of the

S. E. Kelf.

DORCHESTER ABBEY.

U. E. Camera Club—under the "ivy mantled tower" and memorial window, and kindly explained the treasures in his keeping. He incidentally remarked that some visitors thought it was time to remove the old brick burial-place of Gray and put something more elegant in its place. Rightly, the vicar holds that it would be nothing short of sacrilege to disturb any portion of it which Gray had placed there, or those of Gray himself.

"There they alike in trembling hope repose,
The bosom of his father and his God."

But as I wish to describe another ramble, I must say no more about Stoke Pogis. From Henley the river winds very much right up to Oxford. The Great Western Railway crosses it many times, so we will keep the riverside this journey, passing through Shiplake, and Wargrave, and Sonning, all pretty spots, with country seats and fine parks in sight. Sonning Lock is a type of many on the Thames, although it may be a trifle prettier than

S. E. Kelf.

MONUMENT TO SIR JOHN HAMPDEN, CHALGROVE FIELD.

some. Passing Reading, the riverside of which is getting so spoilt by hotels, electric-light works, and so forth, that photography, as far as nice pictures are concerned, is of late years out of the question, we stop at Mapledurham, about three miles west of Reading, and take a very pretty water-mill.

Pangbourne, Goring, Wallingford, are reached. I gave a pic-

ture of Wallingford Bridge, which was published in last year's ANNUAL. Dorchester, a little higher up, comes in view, and we have a look at the "Abbey." There are some very fine windows here. (Being Passion Week the crosses are craped.) We got one; the others are difficult to photograph, the famous "Jesse" window, being at the left-hand side, close to the one shown. On another occasion, leaving the river, we went through some old-fashioned villages. Nice pictures can be got, but they are off the main roads and difficult sometimes to find. As I have a partial regard for "water pictures" I keep to the rivers and streams.

But I must now finish. Returning by way of "Chalgrove Field" I came by a monument. Beside it were only crossroads and cornfields. So, as I was obliged to stay in order to wait for some passer-by to ask my way, I thought I would use one plate, which I wanted for another purpose. I am glad I did, as I am able to ask you to reproduce it at the end of this article, so that you may see that even after two hundred years the people still cherish the memory of John Hampden, that great commoner, who lost his life fighting with the parliamentary army against King and Courtiers, for the civil rights, not only inherited by us, but by our friends on your side of the Atlantic Ocean.

THE CHOICE OF A CAMERA.

BY ROMYN HITCHCOCK.

SO much has been written on the choice of a camera for amateur work, that I would not presume to take up the well-worn subject in the hope of adding anything new. But questions are frequently asked me, and it is certain that the novice still finds his first inquiries insufficiently answered. What size shall I get? How much shall I pay? Should it be a hand-camera, or must I have a tripod? How about films and plates? These and numerous other questions arise and must be answered one way or another.

To some extent, each case must be considered by itself, as in the matter of price, for example, but perhaps it is possible to put the matter in such shape that the novice can decide for himself.

As regards the most suitable size for a tripod camera, I am disposed to favor the 6½ by 8½ plate. Much of my own work has been done with an 8 by 10 size; but while it certainly is a satisfaction to have the larger pictures, I am convinced that the additional labor involved in transportation, and the excessive weight of the plates, is out of proportion to the final result. The smaller size gives pictures quite large enough for satisfactory prints; nothing more is shown on the larger size than can be distinctly made out on the smaller, and the latter is much more easily and quickly manipulated.

There is, indeed, the 5 by 7 size which is convenient, but often one wishes to make a picture more than five inches in height, for which purpose the camera must be taken off the tripod and turned on end, making a somewhat awkward affair to work with. Some of these cameras are made with revolving backs to meet such contingencies, but this involves considerable increase in size, and is, therefore, not economical of space.

For smaller sizes I do not favor anything less than the size of lantern plates 3¼ by 4. It is true, some of the smaller affairs are excellent as mechanical contrivances, and very pleasing photographs can be made with them, but the pictures are entirely too small for satisfaction. For the 4 by 5 size, the camera should be of the folding type, which can be used with or without a

tripod. For still smaller sizes it is not advisable to use a tripod. These should be strictly hand-cameras, with shutters adjustable for time exposures and for quick action of different degrees of speed. The 4 by 5 size should be made for both plates and films, and there should be a ground glass focussing screen and adjustment for focussing, with a means for changing the size of the lens diaphragm. With this size, time exposures should be made in preference to instantaneous shutter work. The average amateur does not realize that it is far more difficult to make good pictures with a shutter than it is to make time exposures. I maintain that this is true. Certainly, time work requires greater exercise of experienced judgment, but this can be acquired, and the results are very much better. Most amateur shutter work gives evidence of under exposure. The results are good, the pictures are brilliant and pleasing, but that is because they are small. The same pictures made without the shutter and properly timed would be very much better.

For sizes smaller than 4 by 5 there are innumerable forms of hand-cameras which are excellent. They are made for films, some being arranged to take glass plates, and this is certainly an advantage. There is an excellent form made abroad which is intended for glass alone. The plates are introduced piled upon one another to the number of ten or a dozen, and when the first has been exposed a very simple operation throws that plate to the back of the pile, and the next one takes its place. The camera is in the form of an opera-glass case, which is held before the eye in the reverse position. One side carries a lens and ground glass, the other side is the camera proper. Holding this instrument before the eye, the picture is seen on the glass precisely as it is in the camera. Then by touching the button the photograph is taken, and the operator knows just what he has on his plate.

As regards the relative merits of films and plates, both are good, but on the whole I prefer to work with glass, particularly when operating with the larger sizes. Even in travelling I would prefer the plates with their additional weight and the trouble of changing, than to take the chances of trouble with the roll-holder or of imperfections in the films. A picture that is worth going for to some remote place is certainly valuable enough to warrant all the trouble necessary to insure a good result.

As regards the price to be paid for an outfit, it is not economy

"Dreamt he was a Workin'."

Photograph by H. Brown.
Engraved by
ALBANY ENGRAVING CO.,
Albany, N. Y.

to purchase an inferior instrument. Get the best of the kind, pay a reasonable price for it, and do not make the mistake of spending all your money on a high-priced lens to put on a cheap camera. The latter is a very important part of the outfit. The camera may be weak, or the wood may swell and the sliding parts may not work smoothly, and there may be trouble at unexpected times. So long as the camera is a good one, excellent pictures may be made with a lens that costs only $5 00. I do not intend to advocate the use of cheap lenses, but if you have not sufficient spare cash to get both lens and camera of the best quality, put most of what you have into a good camera, which will last a lifetime, and use a cheap lens until you can afford to get a better one. The truth is, the most expensive lenses are not necessary for the finest kind of ordinary photographic work. It is only in exceptional cases that slight imperfections in a lens can be detected in a picture. The skilful photographer can so choose his subjects that a simple achromatic lens will produce the finest kind of a picture.

A COMPACT RUBY LANTERN.

H. W. Brown.

AMATEUR and professional photographers when travelling or making a tour are often puzzled as to the best kind of a ruby lantern to take along.

A person travelling from place to place with a camera often desires to develop his views as made, and as dark rooms are seldom to be had, particularly in the country or in small towns, the developing must be done in an ordinary room after dark. For such purposes and for changing plates, a ruby lantern is a necessity. The *ne plus ultra* in lanterns is something cheap, light, compact, not easily broken, and giving a safe light. The ordinary ruby lantern is bulky, and, having considerable glass about it, is liable to breakage; and if an oil lantern it is always greasy, and it must be emptied each time you pack up. A candle lantern needs snuffing often, and the melted wax or tallow is a nuisance. After considerable rather unpleasant experience with various kinds of lanterns, failing to find anything that suited me, I finally con-

cluded to make a lantern. After several trials I succeeded in making a lantern which filled all the requirements and was very satisfactory. The one I have now has been in active use for about a year, and in that time it has travelled fifteen hundred or two thousand miles, been packed and unpacked dozens of times and used to developed hundreds of plates, and yet at the present time it is unbroken, never has had to be repaired, and is as good as new. I use Cramer Crown plates, and have never had one fogged from the light of this lantern.

For the benefit of my fellow photographers I will describe how this lantern was made. I first obtained a piece of straw-board twelve by eighteen inches, and about as heavy as that from which the backs of books are made. From this I cut a piece eight by twelve inches for the back of my lantern, and two pieces five by twelve inches for the sides. I then took a piece of cheese-cloth ten by fourteen inches, and on each side pasted a sheet of post-office paper of the same size, which when dry I oiled to make it more translucent, and then trimmed it down to eight by twelve inches, this being the front of the lantern. I found that one thickness of post-office paper did not give a safe light, while two sheets pasted together made a sheet that was very easily broken or torn. So I finally pasted a sheet of paper on each side of a piece of cheese-cloth. The cloth made it flexible and not easily broken or torn, but also rendered it too opaque, to obviate which I oiled the paper well. I then obtained some heavy ducking or canvas for hinges and cut it up into strips two by twelve inches, and painted these strips with red water-color paint in order that any light passing through might be safe. I next took my pieces of straw-board and laid them out on a table side by side, with the edges touching, first the post-office paper front, then a side, then the back and next the other side piece, and with Le Page's Liquid Glue, glued a strip of ducking on to each two pieces, thus connecting the four pieces together. For instance, a strip of ducking two by twelve inches was well coated with glue on one side and laid lengthwise along the edge of the front piece of the lantern which is eight by twelve inches. One half or one inch of the ducking is laid on the front piece, while the other half is laid on one of the side pieces, in this way connecting them together, the flexible ducking acting at the

same time as a hinge. The pieces are all glued together in this way, a strip of wood and a weight being put on each strip of ducking until dry, when the entire sheet is taken up, and with the ducking strips turned inside it is folded so as to form a box twelve by eight by five inches; and a strip of ducking is then glued on to the two ends, joining them together and thus completing our box, which when set on end is twelve inches high, eight inches wide, and five inches deep, the front consisting of the post-office paper, and of course without top or bottom.

For the top I got a piece of three-ply asbestos paper six by ten inches, which I hinged on to the front piece of the lantern by gluing a piece of ducking two by eight inches fast to the front, leaving one half of the ducking projecting above it, and to this I glued the asbestos paper so that the paper laid flat on top of the box. As the asbestos paper projects one inch all around except where it is hinged on, this inch projection is bent down all around so as to fit over the top of the box like a tin box lid. The asbestos being non-combustible, of course will not burn, and being flexible like cloth, the turned over edge will flatten out each time the lantern is folded up. Now about the centre of the top cut a hole two inches in diameter for ventilation. When in use this hole can be covered with a piece of asbestos, say four inches square, bent into a V shape, to prevent the light from being reflected from the ceiling. Also cut a two inch hole in the centre of the back about two inches from the bottom. This is also for ventilation, and allows you to turn your lamp up or down. The light from this hole will do no harm, but a card can be leaned up against the lantern so as to intercept all the light if desired. Now glue entirely around the bottom of the lantern, on the inside, a strip of felt or some similar goods, say two inches wide, allowing it to extend below the bottom of the lantern one inch, so that when set upon a table no light can escape around below.

This done, take an ordinary low hand-lamp, set your lantern right down over it, and proceed to develop. When through, turn the top back down over the front, lift it from over the lamp, lay it down on the front or back, and it at once folds up or flattens out. When folded it is twelve by thirteen inches square and a quarter of an inch thick, and can be laid flat in the tray of a trunk or in the bottom of a valise. It is not

likely to be damaged, being made of heavy strawboard which is not easily broken, nor is the post-office paper likely to tear. As any kind of a small lamp or candle can be used in this lantern, it is unnecessary to carry anything of the kind along.

Cost: Strawboard and cheese-cloth, 5c.; post-office paper, 5c.; glue, 10c.; ducking and felt, 5c.; asbestos paper, 5c.: total 30c. Leaving out the time allowed for the glue to dry, a lantern similar to this can be made in two hours.

THE STORY OF QUEEN ELEANOR'S CROSS.

BY HENRY ERLE COOPER.

IT is difficult to convey to American friends, even by the aid of photographs, the especial charm of a Midland county in England. We have no broad rivers, few waterfalls and mountains, but we have a combination of historical tradition, lovely rural scenery, and a quaint old-time aspect of country life which never fails to charm our American friends when they pay us a visit. Northampton is within seven or eight miles of the Centre Stone of England. Situated on the north bank of the river Nen, the rolling tide of English history has surged to and fro, by its walls and through its streets for the last thousand years. A bright and busy town, famed worldwide for the manufacture of boots and shoes, it bears the footprints of history in almost every street. Let us leave it by the London road on a bright morning in May. Half a mile from the town, on the left, embowered in trees, stands De-la-pré Abbey, now belonging to a prosperous shoe manufacturer, but in the days of the Reformation the residence of a lady abbess so saintly in character, that even Harry the Eighth refrained from troubling her, when all around neighboring abbeys and monasteries were being confiscated and demolished. In the meadows surrounding the Abbey the famous battle of Northampton was fought in July, 1469, between the forces of Henry the Sixth on the one side and the insurgent barons on the other, resulting in the defeat and capture of the unfortunate King. But our present purpose is to saunter on, by hedgerow sweet with Mayblossom, under the

Henry Erle Cooper.

QUEEN ELEANOR'S CROSS.

shadow of the park wall, up the London road. Gradually ascending the hill the road winds slightly to the left; we resist the temptation to cross a footstile into the meadows overlooking the Abbey, and continue our walk until, at the distance of a mile and a half from the town, round a turn in the road, a pleasant surprise awaits the wayfarer, if he be a stranger, for there, standing on a steep bank at the side of the turnpike road, is one of the most beautiful and interesting landmarks in our history. Queen Eleanor's Cross stands before you. The architect of this monument must have had the true instincts of an artist. The site is admirably chosen; viewed from any point it forms a picture which at once arrests attention; a background of foliage serves to throw into bold relief the general contour and exquisite details of the cross. Maybe the stranger will inquire why, in such a secluded spot, so beautiful a monument was erected. The story is a romantic one. Edward the First married Eleanor, daughter of the King of Castile; evidently this was a true marriage. When Edward resolved to take part in the Crusade, and sailed for the Holy Land, Eleanor, too, resolved to accompany the army and share the dangers and triumphs with her lord. There is a romantic story, which I would fain believe is true, that Edward was wounded in the arm by a poisoned arrow; the skill of the "leeches" failing him, Queen Eleanor, at the risk of her life, sucked the poison from his wound and saved the King. This beautiful story may be a myth, but of this we are sure, that no uncertain charm of endearment bound together these royal hearts. Says Mr. Hartshorne, the historian: "One of the most commonly known facts in the personal history of Edward the First is his affectionate attachment to Eleanor of Navarre, and as few kings have left behind them so high a reputation for prudence and valor, so none have exceeded him in attachment and tenderness for their queen." In November, 1290, she was attacked by an autumnal fever whilst staying in Nottinghamshire. Notwithstanding all that was done for her, the illness proved fatal. Attended by the King, the corpse was removed to Westminster, and at each of the places where the mournful procession rested on its journey priests sprinkled holy water on the spot, and Edward ordered a cross to be erected. His design in the erection of these crosses was not merely to preserve the memory of the queen, but to induce the wayfarer to stop and offer up

prayers for the eternal welfare of her soul. It was a beautiful idea, beautifully carried out, for Edward spared no expense or trouble to make these crosses worthy of his queen. In all there were thirteen of them originally erected, stretching from Harby to London ; out of all these only three remain ; vandalism and the hand of time have swept away the remainder, and to-day we are only just beginning to realize their value and regret our loss.

The whole of the crosses were of such just proportion and purity of design that one cannot help being filled with admiration of them, and feel proud of our countrymen who at that distant period, 1290, were capable of conceiving as well as executing such sublime ideas of architectural beauty. In composition they are of the Early English style of architecture. The Northampton Cross consists of three diminishing stories surmounted by a pediment of stone which originally supported a cross of exquisite design and shape, which, unfortunately, was broken off about one hundred years ago. The base consists of nine steps, from which arises the first story, octagonal in form and fourteen feet high ; each side is sculptured and emblazoned with arms, and on four sides are open books in high relief. The second story is twelve feet high and likewise octagonal in form, whilst in every alternate compartment is an effigy or statue of the queen surmounted by a carved canopy supported by two gothic pillars. The upper story, which is richly carved, has four sides facing the principal points of the compass; the total height is over forty feet. But our business to-day is to secure photographic reminiscences of so interesting a monument ere time moulders it away. Favorably situated for our purpose, a background of trees presents the necessary contrast to the light structure of the cross.

This is a subject which lends itself admirably to the use of the long focus single lens. With a small stop, a slow landscape plate, and three or four seconds' exposure, all the exquisite detail of the Cross can easily be obtained. But the morning is passing and we must wander on. Leaving the road we turn down a country lane by which we reach the little village of Hardingstone; from the brow of the hill on which the village stands, a picturesque peep of Northampton can be obtained through the trees. We leave the village by a narrow footpath which through green fields leads us back in the direction of the town. The brilliant sunshine lights up the landscape with a glow of color and warmth

Henry Erle Cooper.

"SHADOWS DARK AND SUNLIGHT SHEEN
ALTERNATE COME AND GO."

simply delightful. Crossing the stile we reach the edge of Hardingstone Wood, and as we enter the cool shade a scene presents itself which cannot fail to remind us of that matchless prelude to Longfellow's poems. Surely he must have looked upon a similar scene when he was inspired to write

> " Pleasant it was, when woods were green,
> And winds were soft and low,
> To lie amid some sylvan scene
> Where the long drooping boughs between
> Shadows dark and sunlight sheen
> Alternate come and go."

It was while sitting in this wood long ago and reading one of John Burroughs' delightful works that I became inoculated with a love of nature which grows ever stronger. For years this wood has been my photographic practise ground; here are to be found leafy backgrounds for figure studies, foregrounds for stereoscopic "bits," and a wealth of verdure which makes a photographic paradise. This morning we use on our camera a lens of a somewhat antiquated type, an actinic triplet by the late Thomas Ross; for an open landscape, such as the Queen's Cross, it is not so well suited, but in these woodland dells, if figures are included, it is without controversy the king of lenses.

I must confess I have never used an exposure-meter, but in these woody glades it requires all our experience to gauge the exposure correctly; however, the advantage of working in a quiet corner of the world like this is the leisurely manner of work which can be adopted. I am old-fashioned enough to believe that focusing is a fine art; to do it properly time must be given to it. But the sunshine shimmering through the trees overhead tempts us onward to the bottom of the glade; we sit on the old-fashioned stile and watch the rabbits as they gambol on the green carpet of the park beyond the wood. At this moment we move aside for the game-keeper with his dogs to pass; he is a jovial fellow, and the sight of the camera induces him to stop and indulge in a little gossip. He was once an amateur photographer, but the care of his pheasants and rabbits demanded all his time, and he gave up photography. Bidding us good-morning he turned into a private "riding" in the wood, and we started on again; we have two $7\frac{1}{2} \times 5$ plates left in our slide; we reserve these to be expended on our last scene, a narrow lane between high hawthorn hedges, named by the rustics of the village "The Double Hedge"

—a bit of thoroughly characteristic English scenery. A row of noble elms overshadows the path on the right hand; Hardingstone Wood, which we left a little while ago, will be seen over the park palings; in the centre a characteristic English stepping-stile leads back to Hardingstone village; here we expend our last plate. A little lass from the town is picking flowers and grasses by the footpath, and is prevailed upon to sit still for a second while we expose our plate.

Our morning's ramble is over. Within a circuit of two miles we have passed the site of the famous battlefield, taken another peep at Queen Eleanor's Cross, spent a delightful hour in the recesses of the wood, and finished an ideal "Photographic Jaunt" within a space of three hours, secretly blaming ourselves that we had not provided a larger number of plates.

In conclusion, England is a little country. Any "American brother of the camera" visiting our metropolis, by taking a railway ticket could in an hour and a half find himself in the midst of the scenery which I have attempted to delineate.

Henry Erle Cooper.

AN ENGLISH LANE.

COMBINATION EFFECTS IN NEGATIVES OR POSITIVES.

By Harold Holcroft, M.A., F.C S.

WHEN reproducing negatives, either enlarged or otherwise, and it is required to add a figure or two, or to put in a sky where the usual method of softening at the sky-line is unsatisfactory, the method now described is easy and requires no cutting out of masks at all.

The idea is described as applied to putting in a sky, but the procedure for the addition of figures will not be materially different.

The method consists in making the transparency on two plates; the landscape upon one and the sky upon the other: the two plates being placed film to film and fastened together.

The landscape transparency is first made by any process; then the sky transparency is made in the camera, using the finished landscape transparency as its own mask.

The details of the process are as follows:

From the original negative having a sky which prints white, a transparency is made by any process desired. This landscape transparency, when dry and finished, is placed film to film with the sensitive plate which is to become the sky transparency; these two plates are placed true with each other, temporarily fixed by means of strips of gummed paper round the edges, and placed in the copying camera with the landscape transparency nearest the lens. The desired sky is copied from a sky negative on the sensitive plate through the finished landscape transparency, which acts as its own mask. After exposure, the gummed strips are removed and the sky transparency developed; when this is dry and finished, the two transparencies are replaced in position film to film, when they will be found to fit one another with perfect accuracy.

It only remains to bind the two plates together, and the combined positive is ready to be used for making the final negative in the copying camera.

Whether the description is easy to follow or not, the process is simple enough and has some great advantages. First, if the sky

you put in does not suit the subject as well as was expected, another one can be substituted easily, as the landscape transparency is already made and again available. Next you can devote your whole attention to making a perfect landscape transparency without being troubled about the sky, which you take in hand afterwards and with the same advantages.

It must be remembered that being placed film to film, the sky is reversed, which must be allowed for on the copying camera. Also in using the landscape transparency as a mask, any parts which are clear glass should have paint dabbed on the back.

Even delicate half-tone seems to act efficiently as a mask during exposure, perhaps owing to the comparatively feeble light transmitted by the lens; but in practice it is best to dab some burnt sienna or other pigment roughly on the back of the landscape transparency, so as to cover all the landscape portion, but nothing which is above the sky-line which has any opacity whatever should be touched. In some transparencies there may be one or two high-lights in certain positions, which require more accurate stopping out, which can, of course, be done with a brush on the front of the varnished transparency by daylight, before fixing to the sensitive plate which is to carry the sky.

I have not yet tried, but should think that the method could be worked without a copying camera by making use of very thin celluloid film for carrying the landscape transparency; but there might be some trouble from the buckling propensities of celluloid which would interfere with exact register.

THE IMAGE IN NEGATIVES.

BY CHAPMAN JONES, F.I.C., F.C.S., ETC.

SUFFICIENT attention has not hitherto been paid to the nature of the material that forms the image in negatives. The ideal negative has a fine silver image in a pure gelatine (or other) film. Any sensible departure from these conditions must lead to uncertainty and may lead to disaster. So far as the image is concerned, the constituent other than silver that is most likely to be present is the dark-colored mat-

"Little Sunshine."

Photograph by SOMERS.
Engraved by
J. MANZ & Co.,

ter that results from the oxidation of the developer. Since I pointed this out two or three years ago the matter has received a little attention from a few experimentalists, but it is not yet sufficently appreciated even by photographers that might be expected to understand the technicalities of photography. It is the sodium sulphite that prevents the deposition of this staining matter and consequent production of a false density in the negative. When advice is given to considerably reduce the quantity of sulphite, we may be sure that either the plates are faulty and will not give a sufficiently dense image in pure silver, or the adviser has not learnt how to manipulate the plates. It is a mistake to suppose that a very much less quantity of potassium meta-bisulphite, as it is called, will suffice because it keeps pyro in solution colorless for a sufficiently long time. One may use rather less of this salt, but only because sodium sulphite when crystallized contains half its weight of water, but the bisulphite is better avoided because it is in no way superior to the other in the developer, and it requires an uncertain amount of alkali to neutralize it. By using plenty of sulphite in the developer, and fixing after just a rinse in a bath which also contains sulphite and is made decidedly alkaline with carbonate of soda, one will have conditions that may be expected to give a fairly pure silver image. Any treatment with acids should be avoided, for although the staining matter may be thereby lightened in color, it is rendered less soluble.

THE VALUE OF A GOOD REPUTATION IN PHOTOGRAPHY.

By E. K. Hough.

EVERY portrait photographer should regard the making and keeping of his artistic reputation as a most sacred duty. It should be as sacred to him as the reputation for virtue to a lady, and should be guarded with the same scrupulous care; for a breath of evil report will tarnish one as well as the other, and a reputation once tarnished is as difficult to restore in the artistic as in the moral world. So any photographer having been so fortunate as to acquire a good

reputation in any community, should guard it, as I said before, with most jealous care; guard it as he would the "apple of his eye"; guard it as the most precious possession in his keeping.

He should do nothing to injure his reputation himself, and be ever on the alert to prevent others from hurting it in any way.

To not injure it himself he must never relax his efforts to do in every case the best work he knows, for work done will either add to, or subtract from, the sum total of his reputation. And he may never know, except by the consciousness of gaining or losing, how some seemingly insignificant work well done, or carelessly and slightingly done, has helped to make or mar his fortunes.

More reputations can be lost in a day, sometimes, than can be regained in a year.

A good reputation for a portrait photographer means more than the reputation for making good work. It means a reputation for honesty and fair dealing; it means a reputation for keeping promises; it means a reputation for urbanity and kindness; it means patience and good temper; it means intelligence and gentlemanly bearing at all times.

The continued exercise of all these qualities, coupled with the ability to make pictures up to, or a little above, the average, will infallibly make a reputation worth money to its possessor.

But to keep it there must be no letting down; no acceptance of a lower position; no falling off from the high-water mark of a full and lofty ideal. There must be no saying, "It 's good enough," when you know it can be better; no presuming on your reputation to pass inferior results; every effort should be made as if your reputation was to be decided by that alone.

If governed by motives like these,—and every young beginner can be,—you will almost surely acquire, and as surely keep, that most priceless possession a photographer can have—a good reputation.

Like an enchanter's wand a good reputation, once acquired, seems to smooth away all difficulties, and makes your work easy. Your customers do not come in a doubting, questioning, suspicious mood, but place their orders with a frank confidence that is inspiring. They defer to your opinions, and submit to your requirements, with such unquestioning faith, that your own self-respect compels you to live up to the reputation they ascribe to

you. And in so doing you continually confirm and augment the beneficent power that as continuously smooths away the difficulties for you that so annoy and torment those of your brethren who have not, like you, taken the early resolve to surely acquire, and always maintain, "a good reputation."

But few photographers who have been many years in business but can look back on times and occasions where some lack of care, some presuming on acquired reputation, some temporary letting down of temper, or patience, or skill, has cost them dear in after labor to regain lost ground, and has caused them to know that, as perpetual "vigilance" is the price of "Liberty," so it ever is of a good reputation.

STANDARDS IN PHOTOGRAPHY.

By Professor W. M. Stine.

THOSE versed in the general history of the exact sciences know the extent to which the subject of standards dominates. This applies not only to physical magnitudes but to methods and processes as well. This tendency is by no means confined to scientific pursuits; but as one of the most significant features of the present times, is fast permeating nearly all branches of the manufacturing industries, replacing guess-work and failure with certainty and success. No matter what the operation—scientific or industrial—the same scientific spirit should pervade it, the aim to rationalize and systematize each step.

Such observations are full of suggestion for photographers. In spite of all that investigation has done, the practice of photography is very largely empirical, and almost every process in the art is complex and embraces a number of tedious details, each one vital for success. It is difficult to find an occupation in which more time may be wasted and failures encountered. But much may be done to alleviate this; in the first place by the individual photographer in the daily practice of his art, and further by the profession at large.

The practice of photography only becomes an art when each step is systematized and all its processes are carried on according

to fixed standards. To begin with the operating room, the lighting and each accessory used should be made the subject of careful study. In most galleries there is too great a variation in the density and general qualities of the negatives. The tendency is to make exposures by rule of thumb, and rarely to use mechanical time-shutters. In spite of the criticism which old operators may oppose to this suggestion, conclusive experience can be adduced in its support. When time-shutters are used, negatives can be made day after day with a surprising degree of uniformity, if the lighting and weather effects are reduced to a thorough note-book system by careful experimenting. The matter, however, becomes complicated through the use of screens, reflectors, and accessories, and the distinction between the mere mechanical and the artistic operator must be borne in mind; yet there is abundant scope for standard exposure-times and conditions. The uniformly successful treatment of the plate demands proven standards. A standard formula for development should be adopted after careful and considerate experimenting, and thenceforth strictly followed. All ingredients should be carefully weighed and measured, and nothing left to guess-work. The number of developing agents is large and on the increase. A good deal can be said about the progressive spirit which suggests trying new formulas and developing agents as they appear from time to time. We will take it for granted that the photographer who reads at all has sufficient progressiveness to incite him to experiment. In the first place he should understand the general action of the auxiliary chemicals entering into formulas; then it is a mere act of judgment to decide whether a proposed formula is an improvement over the one in use. If so, let it be tested, but proceed systematically, and, if it proves a better one, adopt it; but in all changes of methods, materials, and processes, make haste slowly. Adopt a new formula, or a new brand of plate, only after repeated and thorough experiment has shown convincing superiority. By all means try new developing agents as they are discovered. All this takes time and involves no small expense, but, if done judiciously, will bring its own reward. It pays financially and in personal satisfaction to be progressive and on the lookout for improvements; but in all this it is well to remember that patrons should not be experimented upon, but are entitled to the benefits of approved experience.

The subject of dry plates is one that needs but little discussion; general practice has settled upon a few brands between which there is but little choice. Commercial reasons may suggest a change, but in such cases the above remarks are equally applicable.

There remains to discuss the question of printing papers, and methods for working them; and the papers now in use are by far the most unsatisfactory of the photographic materials, and there are very few photographers who are not meeting with financial loss through the failures and uncertainties of the printing-out papers.

In summing up the results of experience and observation of the recent years in which gelatine and collodion papers have come into general use, the impression grows that the fault oftener results from the manipulation than the poor character of the papers. Faded prints but a few years old and often but a few months are entirely too common. Inartistic toning is a grave fault of too many, and there is much dissatisfaction amongst the better class of patrons whose artistic sense, cultured beyond that of the photographer, is repelled by the cold, blotchy toning of the combined baths. The matter of the choice of paper requires nice judgment and much careful experimenting. One of the principal commercial photographers in the country recently related to the writer his experience with the selection of paper and processes, and it is so much to the point that it deserves to go on record. He selected the most reliable makes of papers for a competitive test and a representative line of negatives and worked each brand of paper under the series. The prints were then carefully toned and fixed according to the formulas and methods prescribed by their manufacturers, using in each case both combined and separate toning baths. The finished prints were then exposed in series to the ordinary light of the gallery, to direct sunlight, and even to the weather. The test lasted for one year. Most of the papers faded to various degrees, but from the test he was able to select a paper which proved entirely durable, and besides possessed the merit of being worked by practically the same baths and methods as the old albumen type. He at once exclusively adopted this paper, and has worked it since to the complete satisfaction of his patrons.

In these times when the variety of papers is so large, and the

baths and methods so various, there is no other course left to the photographer than that just outlined; nor should it be shirked on account of the labor and time involved. In the first place an intelligent experience with the general action of the toning and fixing baths usually prescribed is indispensable. This can only come through careful experimenting. It is needless to particularize here; the moral is, experiment and select a standard toning bath, and ascertain its conditions for gradations of tone effects.

The fixing process seems to be largely responsible for failure. With separate toning, the fixing bath using some hardening agent or other should be very carefully experimented with, and the prints subjected to a long time test. In all cases, thorough washing of the prints is presupposed. After such experimenting the intelligent worker will not be at a loss in selecting his favorite materials and processes, and after making the selection will be thoroughly convinced that success will follow faithful adherence to his standard methods. If, in addition, the photographer be familiar with some chemistry and physics, he will not be slow to realize that permanence depends largely upon simplicity. Complicated toning, and especially fixing baths, are too apt to introduce unstable compounds into the finished print. It is positively shocking to one's chemical sense to introduce a toned print into some of the vile smelling and complex fixing baths which have been in use. The ideal paper is one whose film permits ready osmosis or penetration in the baths, and which will fix in a plain hypo bath.

It will be a great gain for the art when paper makers will depend on superiority of manufacture for competitive excellence, rather than on secret formulas. If the photographer could be truthfully told the exact ingredients of the paper offered him, there would be less uncertainty at the outset as to durability.

The above discussion may contain some more or less important suggestions for the amateur. If standards are necessary for the practical photographer, they are far more important for the amateur who works photography only at infrequent intervals. But the amateur as a rule has neither the time nor facilities for extensive experimenting, and for these reasons is compelled to rely upon the advice of some intelligent practitioner.

PHOTOGRAPHY IN THE SIERRA MADRES.

BY ERNEST BERINGER.

FRESH from the old country, full of fogs and drizzle, characteristic yet so essential for the type of landscape peculiar to the British Isles, the brilliant, clear atmosphere of the Sierra Madres of tropical Mexico threatened difficulties to my photographic practice, suggesting doubts as to the best course of procedure to obtain results possessing sufficient merit to call for even passing notice. An examination of photographs coming under my attention as being representations of the locality soon convinced me that a combination of a mid-

E. Beringer.

IN THE SIERRA MADRES.

day sun, a small stop, short exposure, and over-development—if favorable to the accumulation of detail — were each in their turn, and altogether, to be avoided. It was soon learnt that those features in the climate

E. Beringer.

A MOUNTAIN VILLAGE.

with which I was familiar as being well adapted for landscape work at home were desirable and obtainable. Even here on the Sierra Madres, effects of fog could be produced, or any degree of softness desired could be obtained at will, without resorting to fuzziness (which, however, I have seen practised to the same purpose with excellent result). One of the great faults in the photographs spoken of was the selection of high points of vantage, apparently with the view of absorbing as much of the universe on one plate as possible. High vantage points are excellent as affording opportunities, but without the assistance of foreground and a touch of middle distance mean exceedingly difficult treatment. It seems almost impossible to convey that sense of magnitude with which one is so impressed when looking on the natural scene. The rising clouds was taken at a high altitude in the very early morning. "A Mountain Village" is taken at low altitude, and shows a suggestion of repose not too frequently seen in photographs of this description.

"LIFE."

AN IDEA PORTRAYED PHOTOGRAPHICALLY.

BY DR. HUGO ERICHSEN.

NOT long ago I conceived the notion of expressing an idea in a photographic manner, and, after cogitating more or less on the topic, I determined to choose "Life" as a subject—ever changeful human life. In the midst of life, we 're in the shadow of death ; there was never a more truthful saying. The young man facing death at the chessboard, does not know when he will be checkmated. The game is still young, but an unwise move on his part may bring him to grief. Death is certain to win in the end. He is the champion chess-player of the world, to whom every other man must succumb in due time. Even Steinitz, master player though he is, will be checkmated ultimately by the grim destroyer of human life.

And yet, after all, he is also the friend of man, whom he often removes from pain and misery, and whom he introduces, let us hope, to a better life than that with which we are acquainted. He is only feared by the thoughtless, but beloved by the weary and

Dr. Hugo Erichsen.

LIFE.

those who are incurably ill. He is the great physician who heals all maladies and wounds, even those which time has tried to heal in vain. He should, therefore, not be abhorred to the extent he usually is. Oft his gentle hand falls on those to whom life is a burden, and he leads them out of the vale of tears into that glorious valley where there is ever sunshine, and where human happiness is constant and not intermittent.

PHOTOGRAPHING WITHOUT A CAMERA.

By John W. Sanborn.

AN outing trip may be made delightful and profitable by a simple method of photographing without a camera. Of course such photographing must be confined to leaves, flowers, and wings of insects, and, with a little care, beautiful results may be obtained.

The process is not new, nor do I claim any special originality for it, although I hit upon it about fourteen years ago without suggestion from anyone. My purpose in writing a few short paragraphs about it here, is to call attention to it and to give some of my own observations which may induce others to try the method, that they may derive pleasure from it as I have done. The pages of the International Annual have for some years given me great pleasure, and it may chance that this article will put others in the way of pleasure.

The outfit needed is very simple: a photographer's printing frame and a clear glass to fit it, sheets of photo paper of the size to fit the glass, and a bag to carry the outfit in and to protect the paper from the light. Select the best leaves of a plant, or any leaves you wish to photograph, or the petals of a flower, and lay them (under side up) on the glass in the frame, then lay the photo paper over, having the prepared surface against the leaves, and put paper or felt backing over all, and fasten down the frame-back as in ordinary printing. A little practice will determine the proper length of exposure. These leaves or parts of the flower are in reality negatives through which the sun prints all the delicate parts of the leaf on the paper. The results to be attained

are oftentimes surpassingly beautiful. I have found it pleasant, and of scientific value as well, to take a small camera and photograph a glen with its over-hanging foliage, then gather the best specimens of leaves from the glen and print them as described. Systematized groups of studies of the highest usefulness may thus be secured.

One day I made a camera photo of a bank of ferns in the wood, and then printed the ferns in groups in the printing frames, and nothing could be more gratifying than the results obtained. Of course the printed paper must be toned and fixed as if printed from a negative. The prints one makes this way are actual size and correct in detail, and no pen drawing can equal them for accuracy and beauty. I am using this process to secure a set of pictures for half-tone illustrations for a book.

By the same process excellent pictures may be made of the wings of certain insects, and the whole operation is so simple, and sure, and withal so satisfactory, that by its use one's outings may be made doubly pleasurable.

TO THE NOVICE.

By Joseph Cottier, A.M.

IN these degenerate days of "you-press-the-button-we-do-the-rest" photography, the question of exposure is one very often slighted by the amateur; of course a good developer is a "thing of beauty and a joy forever," but it can never make up all the oversights of the one behind the camera.

The Stop is the first stumbling-block that arrests the progress of the artist; it regulates the amount of light that can enter the lens and reach the plate. Therefore the exposure will vary inversely as the square of the diameter of the stop, all other things being equal, for the area of a circle is proportional to the product of the diameter by itself. Thus if with a certain "diaphragm" or "stop" one second of exposure is needed, with a stop of one-half the diameter the same subject will require four times the exposure, for the area of the second stop is only $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

that of the first, allowing only one-fourth of the light to pass through the lens.

The FOCAL LENGTH of the lens also affects the time of exposure, but this time, all other things being equal, the time of exposure varies directly as the square of the focal length; for, if the focal length be doubled, the linear dimensions of the plate covered will be doubled, its area quadrupled, and the amount of light acting per unit reduced to one-fourth its previous value, the exposure being thereby quadrupled. Hence if the focal length be doubled, and the stop diameter be at the same time doubled, the exposure will be made four times as long because of the increase of the focal length; but this will be reduced to one-fourth or to the original value, because of the stop opening. Herein lies the explanation of the habit of expressing the stops as fractional parts of the focal lengths; for evidently with all lenses, sensibly, the same subject will require a similar exposure if the stop is in each case the same fraction of the focal length; and, as was noted in the previous paragraph, with different stops the exposure will vary inversely as the square of the stop dimension.

Aside from any effect the distance of the subject may have on the exposure, due to the motes in the atmosphere, comes a correction of the same character as that for changing the lens, keeping the stop constant; for, the closer the object, the more must the bellows be drawn out, and the more plate must the same amount of light cover; thus, in copying to exact size of original, the bellows must be drawn out to twice the focal length, and the area of plate and consequently the exposure increased to fourfold the value that would otherwise have been expected. That this effect is however generally negligible in the field will be seen from the accompanying

TABLE OF RELATIVE EXPOSURES.

Equivalent focus of lens.	Distance in feet of subject from lens. ∞	100	40	25	15	10	7	4
12"	1	1.007	1.05	1.08	1.14	1.25	1.36	1.8
10"	1	1.005	1.04	1.06	1.11	1.18	1.29	1.56
8"	1	1	1.03	1.05	1.09	1.15	1.21	1.45
6"	1	1	1.02	1.03	1.07	1.10	1.14	2.28

For the allowance that is to be made for the different subjects

A Young Mechanic.

Photograph by VAN LOO & TROST.
Engraved by
WEEKS ENGRAVING CO.,
631 Chestnut St., Philadelphia, Pa.

that may offer themselves, many tables have been proposed: there is one in the back of this book, and I am going to give another; but pray do not be frightened at the apparent lack of agreement, for although each man may have a different schedule all will expose the same; the only difference lies in the meaning which each individual assigns to the terms that enter therein. The one here given, besides giving very satisfactory results, has the advantage of a dual ratio between the terms:

TABLE OF COMPARATIVE EXPOSURES.

Subject.	Sea and Sky.	Bird's-Eye View.	Open Landscape.	Bright Foreground.	Dark Foliage in Foreground.
Relative Exposure.	1	2	4	8	16 to 32

For the variation of light at different times of the year, the beginner is advised to pin his faith to some good table of the comparative value of daylight, such as Dr. Scott's, published in the last ANNUAL, and probably repeated in the back of this book. In addition to this is required an additional scale to allow for the meteorological variation of the light. When sufficient expertness has been acquired to classify any day among the different divisions, the following table will be found very serviceable:

Sunshine.	Sun Obscured.	Cloudy.	Very Dull.
1	2	3	4 to 6

The numbers in Dr. Scott's table should be multiplied by the correct coefficient from the above table.

Little need be said about the plate: that is a matter of experience; but too much faith may easily be put in the published claims of the various plate-makers. Furthermore, a sensitometer number obtained by conventional methods does not necessarily have any relation with the practical action of the plate in the field.

The object of this long discourse is to recommend the amateur to profit by it in the making up of an exposure note-book that will have the utmost simplicity; in fact, it will only consist of one number for each make of plate used. This number will be the exposure that is to be given to that plate with a unit stop (either the largest stop of your lens if you use only one lens, or

the Uniform System Number Unit, f–4, if you use several), a unit subject (Sea and Sky), and a unit intensity of illumination (a sunny day in June or July between 10 A.M. and 2 P.M.). The requisite exposure under any other conditions may then be readily obtained by multiplication by the appropriate coefficients.

This standard exposure must be obtained experimentally, by averaging the results obtained from several correct exposures. As an example of reduction to standard, let the case be taken of a group of children in the fields, August 15th at 8 A.M., with the sun temporarily hid behind a cloud, and a stop of diameter one-third that of the largest stop, or area one-ninth as great; and let the exposure have been 2 seconds. If the standard exposure had been known, to calculate the requisite time in this case it would have been multiplied by 9 to allow for the smallness of the stop; by 2 because of the time of day and year (see Dr. Scott's table); by 2 again because the sun was obscured; and by 8 as the factor of a "bright foreground"; or, in all, the standard exposure would, multiplied by

$$9 \times 2 \times 2 \times 8 = 288.$$

But the correct exposure is known to have been 2 seconds, hence the standard exposure must be $\frac{2}{288} = \frac{1}{144} =$ or, sensibly, $\frac{1}{150}$. The average of several such results will give a standard that can be relied upon.

One word more. In taking instantaneous views, the time of exposure is not the total time that the shutter remains open, for part of the time the shutter is opening, and does not give the full opening; and most of the remainder of the period it is occupied in closing, and gives the plate short measure of light. The loss of light thus incurred varies from zero to two-thirds of the whole amount, and it is the effective time of exposure that must be operated upon, being from one-third to the whole of the time the shutter remains open. A practical method of determining the effective time of exposure experimentally will be found in *Anthony's Photographic Bulletin*, No. 12, June, 1891.

THE SIMPLEST PRINTING PROCESS.

BY MARTIN J. HARDING.

OF the great number of printing papers ready to our hands, there is one which, I think, has not received the attention that it most certainly deserves—viz., the printing-out Platinum paper. When first introduced, now several years back, this paper was very imperfectly prepared, or rather varied very much in quality, and was consequently thrown up in disgust by many workers. But it was not only from defects in the paper itself, but frequently, I am convinced, through ignorance of its one characteristic peculiarity, that its failure to attain any general popularity was brought about. The fact that it is absolutely necessary for the paper to be more or less damp before it will print at all was scarcely grasped by many users who, in the hope of more rapid printing, placed their frames in direct sunlight, thereby positively retarding the printing action which required only a good diffused light.

Now that great improvements have been made in its manufacture, and with a choice of several brands on the market, I have every confidence in again drawing attention to this very beautiful process which for simplicity of working stands unrivalled. There is no preliminary washing required, no toning, no hyposulphite fixing, no curling, no frilling, no blistering. The subject is simply printed to the exact depth required, with full control for emphasizing or suppressing detail, there being nothing lost in the finishing, which consists merely in passing through three baths of dilute hydrochloric acid for five minutes each, followed by a couple of minutes' rinsing under a tap and drying between pure blotting-paper. The prints have a perfect matt surface, and give a fine range of beautiful steel-grey and rich black tones, so eminently suited to most photographic subjects. I hope that the foregoing notes may induce many to give the paper a trial, and those who may have already done so, to take it up again, when they will find that careful attention to the exceedingly simple operations required is all that is needed for complete success and satisfaction with this, the simplest of all printing processes.

WASTE NOT, WANT NOT.

By H. H. Williams.

IN one of the Christmas books there is an account of two men who went shooting grouse in Scotland. They shot *very* badly indeed, and were highly disgusted one evening, as they walked home along the road, on being accosted by the old Scotchman, who congratulated them on the bag they had made, cynically remarking that, considering the number of cartridges used, the result was "remarkable in every way."

Now I have seen a similar "remarkable result" for the number of plates used at a camera club outing. Some of the members seemed to have but one idea, and that was to use up every plate they had with them. They never took the trouble to see if the view they had fixed on was the best, or if the light was the right way. No, they saw a bird and they fired away, never minding whether it were a grouse or crow, or if they killed anything or not; they had fired off their gun, and that was what they wanted!

This is no fancy picture, but what I have seen again and again, even with a man using an ordinary camera; but with a detective camera the case is much worse, for then they need only "turn the handle" and "press the button." Now my idea is that a person who won't take the necessary trouble to make a picture had much better leave his camera at home.

How in the world men (aye, and ladies, too) can delight in showing some of the fearful and wonderful things (truly "remarkable in every way") that I have had shown me, and my opinion asked about, is far away beyond my limited understanding. This, of course, does not include the *vast* number that "do not come out," "the sun was the wrong way," etc., etc., but what they consider good. I have often wondered if the Eastman Kokak Co. keep any account of the negatives sent to develop and *what the percentage of failure is.* It would, I think, be instructive.

Now, my idea is, only take a few plates, and make up your mind that you won't waste one. Look each proposed picture well over, and from many points of view. Note particularly the way the light falls, and see if it brings into prominence the most beautiful part of the intended picture, or, in other words, accentuates the point of interest. Don't do one picture that has not

a definite point of interest in it. Look through an average collection of amateur prints—aye, and professional, too,—and note the number of vapid, unmeaning records of earth, sky, and sea you will meet with.

A short time ago I was showing two friends of mine a few pictures by our great photo-artist, H. P. Robinson. Both of them knew a little of art, and one was a good photographer. After looking in silent admiration for some time, one remarked, "I did not know photographs could be like this." Now, the pictures they most admired were an old man, a woman and her little baby in a cottage, and another old man and two children on the sea beach. "Very ordinary subjects," I hear some one say; that is so, I grant you; but the care and skill needed to produce "From Dawn to Sunset" and "A Race with Grandad" were not ordinary. The advice I always give any one who wishes to do good work is, examine as many good pictures by really first-rate men as you can, and try to find out *why they are good;* then think out a picture and try to do it. You won't succeed at once, but you will find that you get better the *more you try.*

In what I have thus far written, I am simply telling my own experience. What I know of art I have learned chiefly from the *Art Journal* and the kindly criticisms of one of the contributors to this volume. His advice has been of so much value to me, that I strongly urge any one who thinks he has made "a picture" to take it to an artist and ask him to point out the *faults* therein. *It is the faults you need telling of much more than the merits.* One thing you will soon find out, and that is how very little is needed to produce a pleasing picture.

The simpler your subject, the more easily will people understand what you wish to tell them. Look at "From Dawn to Sunset"—an old, old man, just on the threshold of another world, and a young mother and her little baby. What could be simpler? The only thing that was needed to make the picture was *Bromide of Brains.*

Now for the second part of my text.

Many failures are caused by dishes not being kept for their proper uses. If you are short dishes you cannot keep each for its own solution. Therefore, in this matter WANT NOT it does not pay to spoil a batch of prints or a few negatives for the price of one dish.

Personally I much prefer *white* china or glass. You can see when they are clean, and, if needed, clean them with strong nitric acid. Rubber, celluloid, etc., will not break so easily, but are much more difficult to clean, and may or *may not* resist the cleaning agent used. From the dark color it is often hard to tell when they are really free from dirt. Those who work collodion paper well know what extreme cleanliness is required that no acid, hypo, or other "dirt" gets near the prints. If you don't have separate dishes for toning and fixing, have your printing done away from home, and waste neither your money nor your temper.

Another thing that "want not" applies to is "developer." Use plenty, so as to well cover the plate; one spoiled $6\frac{1}{2}$ by $8\frac{1}{2}$ will pay for many ounces of solution. If your table is not quite level you will often find part of your plate dry, if the supply of solution is short. A dish with ridges on the bottom requires nearly twice as much solution as a flat-bottom tray.

Washing water is another thing that we most certainly ought not to be short of. There is no "Hypo Eliminator" equal to cold water, and plenty of it.

Another often unsuspected cause of failure is dirty hands. Clean hands are of great advantage in many pursuits besides photography!

CHILD PORTRAITURE.

By E. E. Weatherby.

THIS subject has no doubt interested the members of the profession to a greater or lesser degree ever since they embarked as professionals. I had decided to pen a few lines on this subject some time ago, when I was surprised to see in print a very able contribution, under the above head, by a colaborer, who had virtually "stolen my thunder."

After considering the subject at greater length I concluded that he had not written everything that might be said on the subject, and offer the following as supplementary thereto.

My idea is to get the confidence of the child the first thing and make it feel at home. Don't try to terrorize the child with any

such threats as some persons use or allow it to be done. "The mannie will 'ketch' you," "big doggie will bite you," and other such nonsensical phrases I never allow used under my skylight.

Get some idea from the parents as to what they want, in a general way, as regards position etc., and then go to work to make a "picture," not simply a portrait or a likeness. Make the little one feel that you are its friend. (Naturally I refer to children who have attained an age when they are supposed to know and understand something.) Make its surroundings such that it will not feel out of place, but encourage it to accustom itself to its new playground, all the while bringing your influence to bear to make it think that whatever you do or say is the only thing to be thought of at the time.

Is n't it true that a pleasant expression, a winning smile, or a cute position representing some childish act—with appropriate surroundings—will often bring an order, while if the same pose were given under contrary conditions the negative would be refused?

There can be no stereotyped rules laid down for this kind of work as I look at it. Of course a few general suggestions which might refer to a certain class of subjects or to a certain style of picture might be given, but the tastes of customers are so varied, the variety of poses so great, that the best way to do is to be governed by each subject as it is presented to you.

A position that may be just the thing for one child may cause another to look stiff and unnatural, simply because it was natural for the first subject and the opposite for the other. Don't let your little subject get the best of you by getting too familiar or too lively by overdoing the matter, or you will have just as much trouble in subduing it as you would in banishing the reserve in the first place. Let the child choose its own position as far as possible, avoiding any extreme in the line you are pursuing; watch the subject for any chance poses it may assume, although they may not be what you are working for, but which may perchance make a more pleasing picture; in fact, keep your wits about you as in no other branch of your studio work, and make the time-worn ingredient "brains" go farther towards making your picture a success than a few drachms of pyro. Above all, don't allow a row of cousins, uncles, and aunts to line themselves up in the operating room to see "the fun," as they choose to

call it. By a little diplomacy you can work it so as to have the ones you want ready for an emergency. Whether others allow this to worry them as it does the writer I can't say, but I believe it is my greatest source of annoyance. You can't tell what moment some move or noise may cause your subject to move, and of course it will be just at the right time to spoil a plate.

Don't be afraid to make a number of nice negatives, as you may get orders from all, and aside from that you may have something new to show your next customer. Very young children, which might be classed under a separate head as "babies," are a very uncertain quantity, and often impossible to get in any respectable position. However, a little care and a few questions as to what may amuse the child may often serve to lessen the labor necessary to the production of a fine negative.

FILMS.

By H. M. C. Sprunt.

AS I have been using celluloid films almost entirely of late, I am often asked if I find them as reliable as glass plates; my answer is that they are now in every respect as good, and in many respects better. Their wonderful lightness, as compared with glass plates, when going for one's annual vacation, has only to be tested to make one almost vow to give up photography altogether if a return to glass were necessary. Not only that, but the fear of perhaps smashing the result of the whole holiday work used to cause endless worry, whereas with films there is of course not the slightest chance of such a catastrophy.

When films were first placed on the market I tried several dozen, but out of the lot there was hardly one cut anything like the proper size or anywhere nearly square; some, in fact, being at least half an inch out, and try how I would, I could not fit them into the dark slides. After that I gave up films for some time. But going for my holidays and taking plates with me brought the subject of films to the fore again; so I tried them once more and found they were better in every way, but still they would now

Near Whirlpool Rapids, Niagara.

Photograph by E. TANENBAUM.
Engraved by
BALTIMORE ENGRAVING CO.,
Baltimore, Md.

and then buckle a little and, after exposure, slip off the rabbet of dark slide and prevent the shutter being closed. After looking at all sorts and conditions of film carriers, I found them all worse than useless. I then hit upon a very simple expedient—viz., making the rabbet of dark slides $\frac{1}{16}$ inch wider all round (I am referring to the English book form slides). The extension was made by cutting some very thin, hard cardboard the exact size of the plates used, and then cutting out the centre, so as to leave a frame one-eighth inch wide; this was fixed with very thin glue to the rabbet of slides and has answered admirably. To compensate for the films not now registering, I took out the focussing screen and placed a similar frame of cardboard in front of it, which not only brought it into register again, but showed how much the extended rabbet cut off the view. Of course with films the spring division cannot be used, but several thicknesses of cardboard can be glued together till a thick enough division is made to keep the films just tight against the rabbet. Developing calls for little remark except that plenty of solution should be used and the dish kept gently rocking. Nearly all cut celluloid films are stiff enough to be washed in an ordinary plate rack, and the simplest and best way to dry them is to pin by one corner to a lath.

CONCERNING EXHIBITIONS.

By Charles E. Fairman.

THERE has been during the past year considerable discussion in photographic publications about photographic exhibitions, and it is somewhat amusing to the looker-on to note the wide range of opinion on the subject.

We have in some instances the class of amateurs who deplore the awarding of medals at photographic exhibitions, and who seem to have experienced a radical change of heart on this subject, for they state that, after having received a large number of medals at different exhibitions, they have become convinced of the emptiness of the honor, and will hereafter advocate that class of exhibitions which do not award prizes.

The class of amateurs who believe in exhibitions of the Salon character is rapidly increasing, and their contention that the honor of having pictures accepted is sufficient glory for any one, is becoming accepted more and more as time rolls on.

This *may be* true.

It seems to me, however, that the giving of awards at the exhibitions, which admit only the best work, may still be followed out with advantage to the art and to the artist.

It must be conceded that to improve is the most sincere wish of every true amateur, and that everything that will stimulate him in producing his best work is to him of valuable assistance.

We never know how good our work is until kind friends point out its beauties, and we never know how inferior it is until some exhibition committee refuses to accept it: nevertheless, by the comparison of our work with the work of others, we are benefited enough to compensate us for our shattered hopes when our pictures are refused a place in exhibitions, so we must admit that the exhibition is a valuable aid to our progress.

It seems to me that in the ordinary exhibitions and also in those of the Salon class, the pictures hung should be judged by a board of judges who have achieved an art reputation, and whose opinion will carry with it the weight that the report of the judges is not a perfunctory duty, but the careful determination of persons who are competent to select the best work that the exhibition contains.

As for the form of announcing the awards, that is wholly immaterial; a written or printed statement, signed by a jury possessing reputation as artists, should be prized as highly as though the report were inscribed on gold, silver, or bronze. The value of the opinion of the jury is of the first consideration, not the value of the paper or metal on which the report is written.

Some may take exceptions to the granting of awards at Salons, and contend that the honor of having pictures accepted is honor enough, but unless the standard of admission is raised year after year the only thing that the amateur knows about the standard of his work is that it is just as good or just as bad as the work of the other members of the exhibition; whether he has made any progress during the year that has passed is, so far as he knows, a matter on which his own opinion stands as good as the opinion of others in the class in which he exhibits.

The great trouble is in assuming that to exhibit in the Salon is reaching the highest plane of excellence in photographic work, and unless we are self-satisfied we should always be anxious to find out whether we are really progressing or standing still.

Anxiety for progress and desire for reward should not be confounded—the two motives are entirely different.

The ideal exhibition from my point of view is the one that sustains itself by admitting only a high class of work, and then selects from the work accepted, through the most competent judges that can be obtained, such work as stands at the head in its respective class.

An exhibition of this character stimulates and educates the earnest worker, and whenever this is done Art is benefited.

PHOTOGRAPHY UP TO DATE—AND BEYOND IT.

By Emily Culverhouse.

AN Englishman's body belongs to himself,
But surely that proverb was made
Before Dr. Röntgen's impertinent rays,
With furtive, adumbrate, and mystical ways,
Our structures began to invade.

'T is an "habeas corpus" of uncanny source,
A forerunner of agencies evil,
A gruesome, weird, and mysterious force,
(But clothed in a garb of science of course)
A league between man and the devil.

Our dearest possessions are dragged into light,
Our purses laid open to view;
And if friends spot a few yellow sovereigns bright,
Or a roll of crisp banknotes folded up tight,
There 's plenty of borrowings, too.

If your rib has a crook, or a joint is enlarged,
Or a bone an imperfect inflexion,

The faults are enlarged and thrown on the screen,
Through a shadowy outline of flesh, fat and lean,
For inquisitorial inspection.

Calcareous nodules were shown in my lungs,
That I 'm sure I knew nothing about;
And friends as they gaze on this horrible view
Declare " There is suffering in store for you—
'T is the sign of incipient gout."

And the small gold coin that I, when a babe,
By accident re-gurgitated,
Could be seen in the stomach snugly laid,
(For Dame Nature a coverlet cleverly made)
In a nest of soft tissue located.

Your sweetheart your photo will not accept,
" 'T is too old-fashioned by half."
Though you deemed the portrait beyond compare,
She says in her locket she prefers to wear
Your skeleton radiograph.

The sun himself may take a back seat,
Of his rays we are quite independent;
For Mr. Edison says we shall find,
" That with bright fluorescent crystals well lined,
Crookes' tube is in the ascendant."[1]

So, future photographers, rejoice and take heart,
For in spite of its size and immensity,
We can prove that old Sol does not boss the world's show,
We can equal his power and pure white glow,
In undiminished intensity.

[1] Coating a Crookes' tube on inside with fluorescent crystals produces a lamp equal to sunlight in intensity. So the sun burning itself out in the future need not trouble photographers, as we can produce pictures without its white glow. " Boom by Edison," *Amateur Photographer*, June, 1896.

But horror of horrors! a Frenchman declares—
  I trust that his words go for naught—
That he by experiments carefully made,
And doubtless invoking magical aid,
  Has succeeded in portraying thought.[1]

For a steady gaze thrown on the sensitive plate,
  With a *one-ness* of theme and conception,
And fixing our minds in a uniform strain,
Will picture the image begot by our brain,
  And reveal our most inmost perception.

Who among us is safe if this can be done,
  Who can bear such a scrutinization?
Scant courtesy, too, our friends would afford,
When they find that our actions are often a fraud,
  And our words but mis representation.

Oh, sad the results that will surely accrue
  From this shadowy, weird inquisition.
Creating heart-burnings, and jealousies too,
We shall live with our friends, and our relatives too,
  In a state of mistrust and suspicion.

I say to my wife, " Don't wait supper for me,
  For business may cause a delay."
But the Röntgen rays enlighten her eyes,
And by their deep aid she quickly decries,
  'T is pleasure that stands in the way.

She sees in my pocket, so snugly ensconced,
  A bracelet in case, and a fan ;
And doubtless this all-searching thought-reading too,
Brings name and appointment at once to her view,
  So she frustrates my nice little plan.

My Uncle, from whom expectations are great,
  And whose grey hairs I welcome with glee,

[1] From *Standard*, about June 17, 1896. English morning paper, "Thought Photography."

Sees my earnest solicitude after his health,
Was merely to speculate how soon his wealth,
Would descend in succession to me.

I asked my employer a few hours to grant,
To bury my granny that day.
The races were on ——— but I squeezed out a tear,
But sternly he answered, "Your business is here—
I can read all you cannot well say."

'T is a crying shame that one's inmost thoughts
Should be bared to a cynical crew.
To live like a viper under a stone,
Calling neither one's body nor soul one's own,
In a state of perpetual stew.

There 're trials and troubles and breakers ahead,
And for lawyers enough occupation;
For many a quarrel will spring from this source,
And many a pair will seek the Court of Divorce,
By this occult investigation.

If our houses are raided, the law will step in;
Then in justice and plain common sense,
Our bodies and minds should receive the same aid;
And to pry without warrant should surely be made
An illegal and heinous offence.

HOW TO INCREASE THE INTEREST IN TOPOGRAPHICAL PHOTOGRAPHS.

BY FREDERIC G. P. BENSON.

WHEN an amateur photographer has completed what may be called his apprenticeship, and has so far overcome the difficulties of the process that the production of fair negatives and prints becomes a mere matter of routine, his future adherence to, and progress in, the art is largely dependent on the uses to which he applies the knowledge and skill obtained in many instances at a considerable expenditure of

time and money. Many writers have from time to time advocated "specialization" as one means to the desirable end of retaining the worker's enthusiasm, but few if any of those who preach this doctrine seem to take into account the qualifications necessary for success, and to be an unsuccessful specialist is almost impossible, because, unless carried out with some degree of completeness, specialism is practically non-existent. The pursuit of photography in its purely pictorial aspect is limited to those who have some inherent artistic talent, and it would be folly to expect to find among the thousands of camera wielders more than a very small percentage of such gifted persons: a man does not buy artistic skill and taste with his apparatus any more than the purchase of a flying trapeze would make its owner an accomplished acrobat. Photography, then, to a large proportion of its followers remains simply a convenient method of obtaining views of localities which form pleasing reminders of happy holidays, and it is to an easy way of making these topographical photographs, so lightly thought of by more advanced workers, more interesting and valuable, that attention is directed, in this article.

The superiority of a book, on any subject, which is well illustrated, over one not so embellished will be readily admitted; inversely, the claims to admiration of an album of pictures well described as compared with a heterogeneous mixture with the bare titles only given will be as freely recognized. It is therefore suggested that a short account of each view, or series of views of one place, be written in the album. The description need not necessarily be either lengthy or exhaustive; a few lines tersely written will in many cases be quite sufficient to create an interest in a picture apart from its photographic qualities. In some instances, however, more especially of buildings and places of historic interest, a fuller account may with advantage be given. No great literary ability is necessary to do this, as in most cases a little research at the nearest reference library or even a guide-book will give the necessary information, brief extracts from which may be copied almost verbatim.

In addition to making his pictures more interesting, the cultivation of this practise will benefit the worker in other ways. He will gain much useful knowledge which will enable him to take a more intelligent interest in the places he visits. It will also tend to prevent, or at least reduce, the exposure of plates on views

which are neither interesting nor pictorial; further, it will induce more careful observation, and so train the faculty of "seeing" that frequently points of interest and peculiar features will be noticed which have been overlooked by the writers to whose works he may refer for historic data, etc.

The appended description of St. Mary's Abbey will give some idea of what is wanted.

The monastery of St. Mary was founded by Stephen, a monk from Whitby, in 1078. The building, of which the present ruins are the remains, was commenced in 1270, and occupied twenty-four years in erection. The mitred abbot was one of the dignitaries of the land, had a seat in Parliament which entitled him to be addressed as "my lord," possessed several country-houses, and a residence in London. At the dissolution of monasteries, this abbey was taken possession of by the Crown, condemned as useless, and partially pulled down to furnish materials for the building of the King's Manor House and residence for the Lords President of the North. The building was originally 371 feet long by 60 feet wide, the only portions now remaining being the north wall of the nave, with portions of the west front and the bases of the four central piers which supported the tower.

F. G. P. Benson.

ST. MARY'S ABBEY, YORK.

After the Great Cyclone, St. Louis, May 27th, 1896.

Engraved by
ST. LOUIS PHOTO-ENGRAVING CO.
St. Louis, Mo.

FROM EXPERIENCE.

By E. S. Kibbe.

A GREAT deal is written against the combined bath for toning and fixing prints. With careless and "sloppy" workmen I have no doubt it would be a decided failure. And with gelatine paper, I have nothing to say. But with collodion paper—I have used nothing else for over three years, and my prints are *fully* as permanent as when I used the albumen paper. I add hypo frequently during toning, and if the strength of hypo is kept up with almost any of the combined baths now advertised, your pictures will be permanent.

I submit some prints that were printed and put into my show-case, in reception-room, over two years ago. After using them there, they were thrown into a box of extra pictures, and have lain there ever since. [They show no signs of fading.—Ed.]

Now, just a word about advertising. I usually run an advertisement in the home paper (this is a small town of about 1100 people), but what I consider the *best* method for country galleries is to photograph something of *general interest* to the people, get it up in an attractive form with your advertisement, and mail it direct to people in your territory. At one time I sent out over eight hundred, and think the returns from them were more than double those from an investment of the same amount in the columns of a newspaper.

ASCENT OF BEN NEVIS, SCOTLAND.

By W. A. Hyslop.

THE ascent of Ben Nevis, the king of Scottish mountains, has always been a favorite with mountaineers and energetic tourists, but it is only within recent years, since the construction of a proper path, and, latterly, by the opening of the railway to Fort William, that the ascent has become comparatively easy, and its popularity is now so great that no less than eight hundred persons reached the summit in July last (1895).

Fort William, which lies at the base of the mountain, is situated at the head of Loch Linnhe, one of those numerous narrow lochs or fiords so common on the west coast of Scotland, and is easily reached by steamer from Oban, or by the West Highland Railway, which was opened in August, 1894. This road passes through some of the wildest and finest of Scottish scenery. As

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THE FARMHOUSE.

an engineering feat it is perhaps unequalled in Britain. From Fort William the Ben is not visible, owing to intervening rising ground, but from Corpach, just across the loch, one of the finest views is to be had. A comprehensive view can also be obtained from Banavie, the starting-point for the favorite sail through the Caledonian Canal to Inverness. Ben Nevis as seen from either of

these points may at first sight appear a little disappointing, as, owing to its general contour and rounded summit, the great height and steepness are not very striking. But a walk up Glen Nevis soon impresses one with the grandeur of Britain's highest mountain, it being 4406 feet above the sea-level.

Formerly the ascent was one of great difficulty and danger, owing to the absence of any well-defined path, and to the fact

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ON THE SIDE OF BEN NEVIS.

that the last 1500 feet was over an unbroken mass of stones and boulders, where foothold was next to impossible. In the year 1881, Mr. Clement Wragge, of the Scottish Meteorological Society, commenced a series of observations on the summit, and for this purpose had to ascend the mountain daily, when the

weather permitted; and, in 1883, the Society, at his instigation, accepted contracts for the construction of a proper path to the summit, and also for the erection of a meteorological observatory. This path, which is five miles in length and about six feet broad, cost no less than £800. The observatory itself cost £2600, and was opened in October, 1887, by Mrs. Cameron Campbell, of Monzie, whose property the mountain is.

Leaving Fort William by its eastern end, the Bridge of Nevis is first reached, and, on crossing this, a road to the right leads to the farmhouse of Achantee, from where the ascent commences. The lower half of the path, which winds with numerous zig-zags up the face of the mountain, is perhaps the steepest part of the climb, but the surface is fairly good, and the numerous chasms and waterfalls are spanned by wooden bridges. Nearly half way up a considerable-sized loch is passed, and then is reached what is known as the half-way house, where a toll of one shilling per head is levied for the use of the path. The views from the half-way house—more especially looking down Loch Linnhe and up Loch Eil—are very beautiful, and the best use of one's time should be made at this stage, as, in nine cases in twelve, the rest of the mountain will be more or less enveloped in clouds--all view of things mundane being shut out. From the half-way house to the summit, the path, though perhaps not quite so steep as the lower half, has such a rough surface of stones that the fatigue is great, and the numerous remains, in the form of heels and soles of boots, testify to the disastrous effects of the road on pedestrians' feet, and the wilderness of stones and boulders which cover the ground in all directions is wild in the extreme. Save a stray hawk, there is almost complete absence of life, either animal or vegetable, and the complete stillness is awe-inspiring. If clear, the view from the summit is magnificent, though not perhaps from a photographic point of view. The sky-line is formed of a countless array of mountain tops, broken here and there by glimpses of sea and loch. On the east, and indeed all round, are countless mountain tops, the most striking, perhaps, being the peaked and rugged mountains of Skye, Kum, and Eigg to the west and southwest; Schielhan and Cairngorm to the northeast, while away in the southwest, in very clear weather, a faint blue line indicates the coast of Ireland. The finest things close at hand are the profound chasms, in which patches of snow remain all through the

summer, and the precipices, from 1500 to 1800 feet in height, which form the northern bulwark of the mountain.

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The average tourist, unless specially favored by weather, is scarcely likely to see in its entirety a panorama such as above described, but he probably will see what is perhaps more wonderful. When about three-quarters of the way up he will enter the clouds, and at intervals the cloud or mist will suddenly open, and through the rift will be seen the far-distant sea or mountain, on which the sun is shining brightly; then the cloud will suddenly close, the whole not occupying more than a minute; at other times the cloud lifts from the summit, while below all is white like snow or wool, with the various mountain peaks projecting through like islands. It is needless to say that the view of the rising and setting sun under any of these conditions is one that will never

fade from the mind. Accommodation is provided for about twelve persons in a rough sort of restaurant on the top, so that, if so inclined, and one's confidence in the weather is sufficient, these wonderful effects may be seen in comparative comfort.

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ROUNDING THE SUMMIT.

As regards the observatory itself, the illustration will convey a better impression than pages of description. From its exposed position on the extreme summit, it is necessarily a very rough building of low elevation, specially constructed to withstand storms of wind and snow. The life of the three observers on the summit is by no means so dreary as might be imagined. While the regular observations, which are taken hourly, have a considerable degree of sameness, there are frequently unusual occurrences.

For instance, if the summit is enveloped in a thunder-cloud, as the cloud passes away discharges take place, not merely from the cloud, but from all metallic bodies in the observatory, and brilliant flashes spring from the stones with sharp cracks. St. Elmo's fire is also of frequent occurrence, when every part and projection

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BEN NEVIS OBSERVATORY.

is tipped with fire. Brilliant coronæ are frequently seen surrounding the moon, also what are known as "glories." In "glories" the spectator's shadow on the mist is seen surrounded with all the colors of the rainbow. Halos and mock suns are also among the phenomena at times visible. The mean rainfall on the summit of Ben Nevis is 142.34 inches, while at Fort William it is only 75.79, and even this is considerably higher than the average rainfall of Great Britain. The cold is not so great as many would

suppose, though snow lies for the greater part of year round the observatory. The mean temperature is 30 9° F., and the lowest temperature recorded 2.7°.

To the student of human nature the ascent of Ben Nevis is replete with interest in the study of the various weary pilgrims, young and old, male and female, as they reach the top and rush to the restaurant for their favorite refreshment. Some arrive immaculate in collars and ties, while others appear collarless, coatless, and almost speechless, beyond vowing that they will "never, never do it again."

TO JUDGE THE AMOUNT OF ACID NECESSARY IN MAKING AN ACID ALUM FIXING BATH.

By Milton B. Punnett.

IN all formulas for acid alum fixing baths a definite amount of acid is specified, and this does not take into consideration the variation in strength of the different mineral acids nor the varying alkalinity of different samples of sulphite. If to a solution of hypo common alum is added, a precipitation of sulphur and aluminium hydrate takes place; but if sufficient sodium sulphite has been previously added to the hypo solution no precipitation of sulphur occurs, and we need to add only sufficient acid to re-dissolve the precipitated aluminium hydrate.

As an example we give the following bath:

A	Hypo	100 parts.	
	Water	300 "	
	Sod. Sulphite (crystals)	20 "	
B	Alum (common)	5 parts.	
	Water	200 "	
C	Water	10 parts.	
	Sulphuric Acid (conc.)	1 part.	

While stirring A, vigorously pour in B. Aluminium hydrate will separate out. While stirring, add enough of C to re-dissolve the precipitate. We formerly used in conjunction with the alum an equal amount of crystallized magnesium sulphate, but as this salt has little if any hardening power when used without the

Loading Hay.

Photograph by Raymond Lee Newcomb.
Engraved by the
Electro-Light Engraving Co.,
409 Pearl St., New York.

alum, we are doubtful as to its being of any benefit in conjunction with the alum.

Chrome alum added to a solution of hypo and sodium sulphite does not give a precipitate immediately.

The above bath may cause a milkiness in the film, which will, however, wash out.

AN AMATEUR PASTE.

BY OTTOMAR JARECKI.

AT the tag end of a siege of printing, toning, and washing, with the mounting to wind up with, the amateur is in very bad humor for getting out the family kettle and making paste. Besides, he hasn't time—he never has anyway. He can buy paste, to be sure, but he may be "twelve miles from a lemon," or the paste he has may be like Mark Twain's—good for nothing except to eat. Then again, as to paste, why, of course, anybody can make paste. It turns out thick or thin, lumpy or burnt—anybody can make paste. So can the the writer, and if a paste that will stick and will keep for a year with reasonable care offers any inducements, the amateur is welcome to this formula:

A.	Wheat Flour	3½ oz.
	Water	8 oz.
B.	Water	12 oz.
	Salicylic Acid	15 grs.

The flour should be stirred up with the 8 ounces of cold water as smooth as possible. The 12 ounces of water are set to boiling, and for this an oatmeal or farina boiler is especially handy, and the salicylic acid is added. Then the flour and water mixture are best strained through a good-sized wire tea-strainer, to get rid of lumps, stirring to help matters along; and an assistant is very desirable just here to stir the paste itself. If a farina boiler is used, it can be removed from the fire before adding the flour, as enough heat will be retained to cook the paste. Stirring is kept up until the thickness of the mass suits the taste of the operator, when thirty drops of oil of cloves are added and stirred in. With

different batches of flour the paste may be a little thicker or thinner, but the above is a fair average. If much too thin after continued stirring, some more flour can be added, prepared as at first, say one ounce in two ounces of water.

The writer keeps the above quantity in a quart glass fruit jar with metal cap and rubber ring, and it preserves its good qualities for a very long time, and is always ready. A two-inch bristle brush reaches the paste in the jar, and for blotting off and rubbing down I have found a cloth much better, cleaner, and quicker than paper, but this is already recorded in the archives.

SOME FURTHER HINTS ON LANDSCAPE COMPOSITION.

By C. H. Cox.

IN a former paper I pointed out the lines which govern good composition both in landscape and figure subjects, and how the photographer in choosing subjects might at the same time analyze and examine them as pictures conforming to the general rule. To briefly recapitulate. Each picture should have one leading feature of interest; toward this the subordinate parts should tend by the direction of radial lines, which again are surrounded by other certain circumferential lines very much in the shape of the web of a spider. These lines as a rule produce an agreeable and interesting picture as far as they are intelligently followed or found to exist.

There are, however, other considerations, and the chief of these is the distribution of light and shade in relative quantities. True, this is a much more complex matter, but so important to good effect that it is worth while to endeavor to reduce it to some principle which can be tested on definite rule.

A dull, flat picture can be easily made one of interest by the bold introduction of some decided object such as figures, or wagon, or cattle, or apparently accidental incident. If the reason of this is looked for, it will be found that it has altered the whole relative scheme of light and shade. If we look at every subject as translatable into simple black and white, it is evident that the

pictures will contain a definite scale of values. If there is no high light and no extreme dark, the general effect is likely to be poor and flat, and, while contrast is wanting, the story is not as easily told as where it is forcible and vigorous. Suppose, then, we construct such a scale—beginning with white, and gradually lowering, say, in few tones to black. You can take this and see what in your landscape is the predominating tone—how much white there is, and how much of what may be taken as black—or the lowest tone on your scale. Now how are you going to judge about their right distribution as a pictorial quality?

The simplest method appears to be to translate light and shade with ideas of ponderable bodies. The darkest tones you may consider as a weight of iron or lead, the lighter ones as other bodies which in proportion, as they lose weight, increase in volume. To balance your iron weight you require a much larger bulk of the lighter material; so to balance your point of full dark in your picture you need a much wider area of lighter tone, just proportionate to the distance it is removed in your scale from the fullest dark.

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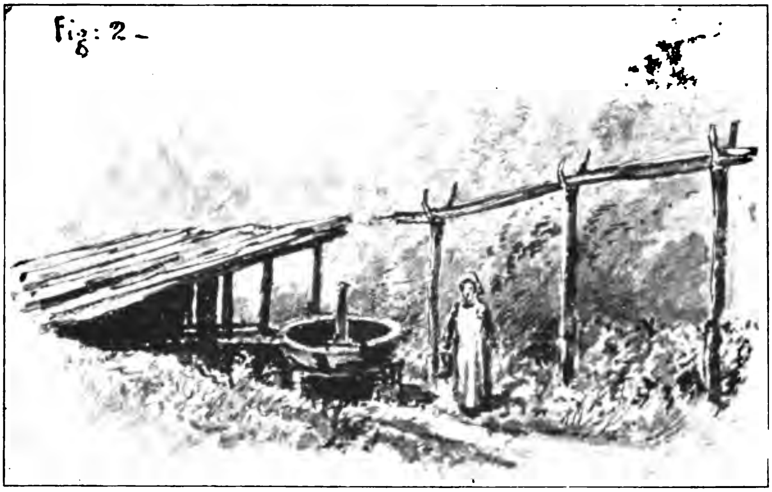
In Figure 1 the total of the full dark is almost entirely in the boat's hull and mast. Next comes a larger surface of a secondary dark in the sails and reflection, and a little in the skiff in the fore-

ground. The higher tones are much more widely distributed. The whole adds up in value to the dark but small area of the hull.



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In Figure 2 there is a larger area of full dark under the shed; hence it is balanced by a wider one of medium tone, which requires only a small spot of white to make a compensating balance to our hypothetical iron weight typified by the full dark.

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In Figure 3, however, we may find it convenient to reverse the process by taking the small quantity of light as the weight to be balanced by a corresponding amount of increasing dark. The idea is the same only differently applied.

The intelligent application of the relative amounts of light and shadow is a valuable adjunct to make a photograph into a picture. If the linear composition be good, and the balance of light and shade be fairly kept or adjusted as it may seem to need it in either direction, you will produce work which is not mechanical, but which tells of the exercise of the intellectual and discriminating faculties: these mark the artist and raise him far above the most skilful manipulator who takes no consideration of the principles underlying all true art.

The rule then would appear to be:

1. Concentration of interest on one leading point—concentration means force.
2. Force can be translated into an idea of weight.
3. Weight needs a counterpoising balance.
4. The lighter the counterposing material, the larger space it will need to make it balance the smaller but denser bulk.

PHOTOGRAPHING NATURAL COLORS.

By Jos. P. Beach.

THE time has come round again for "copy" to be furnished for another number of the INTERNATIONAL ANNUAL, and if the volume for 1897 is at all up to the standard of that for 1896, those who add their "mites" to its contents ought to feel immensely favored by having such a medium of communication with other photographers, either amateur or professional.

"It makes me tired," was the expression heard by the writer one bright morning in this beautiful month of May, while the apple-trees and early flowering shrubs, full of bright colors, were seemingly rejoicing that the earth was again being dressed up in its best clothes, and nature was purposely arraying itself in tints

and tones that are always "things of beauty and a joy forever" to an artistic eye.

The speaker was a painter not unknown among the artists of New York. He was discussing with the writer the physical impossibility of putting upon canvas the varied colors of a beautiful landscape we were both admiring. "It makes me tired," he said, "to find that my colors, when on the canvas, are not those that I see before me in the subject. Sometimes, in sheer vexation, I rub out the work of days and try over and over again until perhaps I do obtain results that my admirers claim to be admirable."

My artist friend expressed the feeling of the writer of this article, who always "feels tired" when he reads in the daily papers or in the magazines articles purporting to describe how some "scientific" photographer has absolutely succeeded in photographing colors as they appear in nature or in the painter's pigments.

We have been informed so many times that Mr. *Blank* has "surely" found out "how to do it," and that specimens of his color photographs are "on view"; but the process is "for the present to be withheld from amateurs and professionals because of some formalities necessary to secure to the 'scientist' the pecuniary results of his imposing discovery."

Time and again has the writer sought the "color" photographs "on view," only to discover that they were not what they were represented to be. One Frenchman showed plates that *did* give off, when exposed obliquely to sunlight, a prismatic coloring, as unlike the real colored picture as a human face differs from a piece of cardboard.

We have all been interested in certain classes of color photography, and have all been benefited by the orthochromatic plates with which we obtain color values and get a picture which will emphasize a color that would otherwise be indistinct or hazy.

We all thought that Mr. Ives of Philadelphia had done something remarkable, and so he had, but when finally he had to invent a mechanical contrivance by which to throw upon a screen the colored result of a series of lantern slides, and produced a harmonious picture by a system of reflectors, we must have felt that color-photography was not to become a possible thing in our day and generation.

At the Paris Exhibition of 1889 the writer was shown plates upon which were deposited colors, blue, green, and brown, which, being held to the light, very clearly gave evidence that some chemical had been deposited upon different portions of the negative, probably before the plate had been developed.

Since Messrs. Edison and Tesla have given to the world the results of their investigations of electrical problems, there have been a number of enthusiastic color-photographers who believed the problem could be settled by an application of electricity.

Electricity was—in some way which they believed they would find—to operate on the sensitive film, and, just as the picture is taken, the current should be turned on, and, presto! all the natural colors would be exhibited in the picture.

These investigators have by this time doubtless concluded that while the electric current has been a wonderful worker in most ways advantageous to the human race, it has not yet taken into its erratic head to help us in the way of color photography. While it is a well-known fact that chemical changes do occur through the action of electricity, and that remarkable results have been obtained, it has not yet been possible to deposit coloring matter upon a sensitive plate, in the same manner that silver or gold is deposited on articles of commoner metal.

That color photography is a myth and a delusion becomes more and more evident when we note the experiments, and, in almost every instance, the total failure of the men who have attempted it. Their enthusiasm gave out when they realized that such colored pictures as they did produce had no sale in the market. There was no demand for the plates they desired to dispose of, and as a consequence we remain about where we were when the proposition was first mooted that "colors could be captured by photography."

In view of the past experience of all those distinguished chemists, and of the lesser known men who have endeavored to reproduce nature's colors upon a photographic plate, is it not tiresome to find in our photographic journals and magazines announcements that some smart fellow has at length succeeded in doing that which all the other experts had found to be almost, if not quite, impossible?

A little reflection, accompanied by a modicum of common sense ought to inform the amateur photographer, as it has already

told the professional, that it is not practicable to pick up the beautiful different colors observed upon the ground glass of a camera, and by means of even the finest of lenses transfer those tints to any plate, film, paper, or other surface in any other colors than the tones representing degrees of black and white.

The general public, less informed than photographic workers, believe ignorantly that colored photographs are soon to be put upon the market, and that it will not be long before their wives, daughters, and sweethearts can go to a photographic gallery, dressed in all the colors of the rainbow, and have the gorgeous picture reproduced at so many dollars the dozen.

When this time does come the INTERNATIONAL ANNUAL will have run its course, and all those who have contributed to its pages will have found an easier way of making their thoughts known to the readers than the laborious process of writing or type printing.

LUTTERWORTH AND NEIGHBORHOOD.

DIGBY H. W. COTES-PREEDY.

LUTTERWORTH is thirteen miles from Leicester, seven from Rugby, and three and a half from Ullesthorpe station. It lies in a district well wooded but somewhat flat, considered one of the best for fox-hunting in the kingdom. A small stream—the Swift—runs through the town. The world-wide reputation earned by this rivulet has its origin from the fact that into it Wycliffe's ashes were cast. A curious legend respecting the above appears in an old book: "Those sacred ashes of Wycliffe were thrown under the arch of the bridge nearest the town; and the vulgar insist that the stream, in ever so great a flood, will not run through this arch." Of course, the old bridge has now been substituted by a new one, built in 1778. At the bottom of the town is situated a well called "St. John's Well," deriving its name from the following legend: "When Wycliffe's bones were burnt, one person who staid after the rest had left his grave in the churchyard, in order to search as strictly after the last bit of bone that might remain

A Box at the Amateur Opera.

Photograph by M. B. PARKINSON.
Engraved by the
ELECTRO-LIGHT ENG. CO.,
409 Pearl St., New York.

of him, as he had done into the erroneous tenets of his adversaries, having found one, ran hastily after his companions with it, in a triumphant and exultant manner, but, before he reached them, fell down and dashed his brains out; and from the very place where he fell immediately gushed out a spring of water, which to this day is called 'St. John's Well.'" It is a well-known fact that the well is never dry. It might be as well if I say a few words about Wycliffe, the "Evangelic Doctor," before describing his fine old church.

Wycliffe was only at Lutterworth about nine years, yet "it was during his incumbency that his character, teaching, and actions produced their marvellous effect upon the public opinion of his time, and laid the foundation of still greater effects in the future." Here it was he accomplished "the great work which crowned all his efforts for the defence and propagation of the Gospel"—namely, the translation of the Bible into the English tongue.

John Wycliffe (or "Wiclif," as he spelled it) was born at Wyecliff, a village between ten and eleven miles from Richmond, in Yorkshire, in 1324. At an early age he went to Oxford, and became after a time Fellow of Merton College. Afterwards he was made Master of Balliol, being subsequently appointed to the Wardenship of Canterbury Hall (eventually merged in Christ Church). But in the following year, through the opposition of the Friars, who "had become an odious nuisance in Oxford," he was removed from the latter post; nevertheless, he still continued to reside at Oxford, and defended "the resistance made by King Edward III. and his parliament to the demand by Pope Urban V. of the tribute and homage extorted from King John by Innocent III." Soon after he was appointed by Edward Rector of Lutterworth, where he "quietly but energetically pursued his great work of translating the Bible, and spreading the Gospel by his Home Mission among the people, laboring at the same time most diligently in his own parish." Wycliffe, after suffering from paralysis for nearly two years, entered into rest on December 31, 1384. In the year 1415, his bones were exhumed and burnt by order of the Council of Constance, and the ashes were thrown into the Swift. The present church is the same structure in which Wycliffe ministered. The earliest portions are the Tower, and the pillars and arches of the trave, which date from the end

of the thirteenth century. The middle of the fourteenth century saw the building of the aisles of the nave. Sir Gilbert Scott, the architect under whom the church was lately restored, considered the chancel to belong to the latter portion of the fourteenth century. The pulpit is really Wycliffe's own pulpit, as the upper moulding and panels are coeval with the earliest portion of the church. There is also an old oak chair, most likely of the same date. A monument, illustrating the labors of Wycliffe, was raised in 1837, and adorns the wall of the new chancel aisle. A quantity of wood was removed from the chancel walls during the restoration, behind which was found a very fine specimen of an early English Piscina, the *fenestella* or recessed niche of which is trefoil headed. The niche contains the usual stone basin, with a perforated drain. A square aumbry or cupboard was discovered at the same time in the north wall of the chancel, which in the old times was used for keeping the sacramental vessels. There is a small hole or hagioscope through the stone-work of the wall on the north side of the chancel arch. This was used by the persons sitting in that portion of the church, to enable them to see the elevation of the Host by the priest. Photographers and other visitors should notice the wonderful frescoes over the chancel arch, and also over the north door. They are of great antiquity. The fresco over the chancel arch is meant to represent the Day of Judgment. " Our Saviour is seated on a rainbow in the centre, with two angels with trumpets on either side of Him. Underneath is the earth with graves opening and figures representing all grades of life—from the crowned king to the nude skeleton—arising from their tombs. A peculiarly horrible sensation creeps over one, as fire is seen bursting from some of the coffins which are gradually exuding their inmates. The effect is heightened by the ground being strewn with ghastly bones and grinning skulls; these are supposed to represent those bodies who have not received Christian burial." There are two or three monuments well worth a plate. Notice should be made of the great thickness of the belfry tower walls, a characteristic of ancient buildings. A pair of old wooden candlesticks, a handsome oak table, two volumes of Wycliffe's Bible, and his vestment are kept in the church, and can be seen by the visitor. The present font is of recent date, being presented in 1704 by the Earl of Denbigh. The old font of Wycliffe's time is in the Leicester Museum. The

visitor to this " venerable pile " should get permission to ascend the tower. A charming view can be obtained from the top on a clear day. The porch on the south side was rebuilt, in 1882, in the same style as the rest of the church. The head of Wycliffe is carved outside the doorway. There is no charge for admission to the church, but all visitors should give the attendant some trifle for showing them around. Permission to photograph the interior can be obtained from the Rector. A capital view of the exterior is obtainable from Church Street, which leads the traveller direct to the main entrance of the churchyard. Morning is the best time for this picture. There is nothing further worthy of note in the town itself, but some plates may be expended with success in the neighborhood.

About a mile from Lutterworth is a pretty little village called Bitteswell, deriving its name from an ancient well. It possesses a fine old church well worth a plate or two.

Three miles from Lutterworth is a village rejoicing in the name of Gilmorton; in the Domesday-book it is called Mortone. The church is a very handsome structure with a fine steeple. There is a large blue slab in the chancel, on which is a figure of a priest, bearing the following inscription: " Hic jacet magister Thomas Syllon, in artibus magister, quondam rector hujus ecclesiæ, qui obiit quarto die mensis Martii anno domini mill, ccccl̥xxiii cujus animæ propitietur Deus." A windmill, which is still worked, is well worth a plate, afternoon being the best time for taking it.

Misterton is another village, at the present time small, but must have been a large place, as many foundations and ruins of ancient buildings have been discovered. It is a very pretty walk from Lutterworth (one mile) to Misterton by the fields and through the park. On the road to the Hall is a very massive stone, supposed to be the bottom of an ancient cross which stood in the middle of the village in ancient times. The church has many interesting features. Above the porch is a specimen of the *domus inclusus*, the retreat of a hermit. Emblems of the Passion, namely, a pair of pincers and a hammer, cut out in stone, are visible outside at the base of the spire. In the chancel is a tomb on which a figure in armor lies. It is one of the best pieces of sculpture in Leicestershire. At the head are the arms of the Poultney family, who flourished in the fourteenth century. There is to be seen a very fine yew-tree in the adjoining churchyard.

The wood required for the old English long bow was furnished by yew-trees; wherefore yew-trees were planted in churchyards by order of the king.

One of the prettiest drives in the country is from Lutterworth to Stanford Church, the interior of which is very handsome. There are some very magnificent monuments to the Cave family, the pieces of sculpture being some of the finest in England. The organ used to be in the banqueting-room at Whitehall Palace, but was sold by order of Cromwell, and bought by the Cave family. Swinford Church, about four miles from Lutterworth, possesses an old Saxon font and a curious round chancel. There is a tomb to the Rev. J. Staresmore in the churchyard. He was a very eccentric man, who died worth a lot of money. He had 58 dogs, 100 pairs of breeches, 100 pairs of boots, 240 razors, 400 pairs of shoes, and numerous other things of a curious and useless nature. If the visitor can spare the time, he should visit Little Peatling (four miles), Great Peatling (five and a half miles), Bruntingthorpe (five and a half miles), and many other spots, well worth a plate, but too numerous to mention. There are one or two good hotels in Lutterworth, where a week or more can comfortably be spent.

CLOUDS.

BY RICHARD M. WORDEN.

I THINK almost every photographer, whether professional or amateur, who has been at work a few years, comes across young friends—and who will deny that our pleasing hobby or profession does make friends, aye, and matches, too—anxious for information and full of queries.

Probably a few explanatory notes on some which have recently been put to me may be—I will hope so—of a little use to some of your young readers.

"I should like to know something about clouds." Well, there are a great many of these in the photographic world, as well as in this world, especially for the beginner; in fact, my friend, you will meet them at many a turn when they are not wanted.

"What sort of clouds do you mean?" Well, in the first place, when a cloud overshadows or appears to cover the sun, everything around is considerably darkened; so it is, you will find, in photography.

Let us take the first active step on your part—that is, the development—where you are certain to meet your very first chemical cloud; and, depend upon it, it will not be a pleasing one.

"Why?" Well, we will presume the exposure has not been hit correctly, and you pour on the plate your half-and-half quantities of developer as recommended in the instructions on the lid of your plate-box or in your text-book; instantly your picture appears, and almost as quickly it is rapidly covered with a kind of mist which increases the further you develop, and do what you will or say what you like, you cannot get rid of it. It is like a bit of London fog on a small scale. This may be caused from more than one source—viz., by light having got to your plate before exposure, which it is liable to from many ways if care be not used, and also by much over-exposure.

There is one point in particular to which I should like to draw attention, and that is the half-and-half quantities almost universally contained in plate-makers' and some text-book instructions. To my mind such instructions are bad and to be avoided. Under no circumstances, save one (and that is when you know for certain that your plate is under-exposed), start work with half of A or No. 1, and half of B or No. 2; but, on the contrary, rather take an extra quantity of A or No. 1, or whatever you may style your pyro-solution, and about half the normal quantity of B or No. 2—*i. e.*, ammonia or soda or other accelerator. In most cases you will find that the second half (ammonia) recommended with the plates is the full amount your plate will stand.

"What cure or remedy then is there?" First, there is that just mentioned—viz., start with a small portion of accelerator, secondly, an extra dose of bromide called restrainer, and, generally, you will observe as you gain further experience that a few drops of a 10-per-cent. solution of bromide, added at the commencement of development, will not do any harm.

Then again there is what is termed halation, which is practically another form of cloud. This is met with in photographing interiors where there is a strong light through the windows, and also in confined or covered situations, such as an avenue of trees

where there is a tolerable amount of space between the nearest trees.

To avoid this, some use anti-halation plates, which are rather more expensive; but, nowadays, people generally look in the other direction, for what they can get the cheapest. Others back their ordinary plates, various methods of which have already been given in the ANNUAL and *Bulletin*. Still, a good many workers do not adopt either of these precautions, but leave it to be overcome during or after development. In the former case a small soft camel's-hair brush is dipped into your 10-per-cent. solution of bromide, and when the window, or other part of the negative where halation is likely to be, shows itself, tilt the developer and apply the brush gently over that part and that part only; this you should do a few times during development. In the latter case a tuft of cotton wool, or a stump, is made, which is moistened with methylated spirits and rubbed gently over the halated part *after* the negative is thoroughly dry. You must not, however, expect to get entirely rid of halation by either of these means, and they are of course only given as helps.

Clouds Proper.—Yes, as you say, these do make a very material addition to a picture—in fact, they often make what would not otherwise be a picture. The chief thing is to have a suitable one to accompany your view, or, better, be without one at all. It is possible to get one in the negative, but it is not advisable to try for this until you have made a little progress. Nevertheless, a hint as to how it can be done will do no harm, and you can try it if you like. As above mentioned, you take your camel's-hair brush, well charged with restrainer, and apply it directly the sky portion of your negative appears, having first tilted the developing solution to the lower half of the negative; care should be taken not to apply the brush too often, or else the sky will be too thin and bad for printing, which is the chief risk incurred.

By far the most general way is to get separate cloud negatives from which to print in clouds into your view. And here again you must watch not to use a right-hand lighted cloud for a left-hand lighted view, and *vice-versa*.

Printing in Clouds.—Briefly, this is carried out thus: Remove your negative from the printing-frame and put in its place your cloud negative; then place the print face downwards and adjust it so as to have the sky covered with the cloud; then take it into

a strong light (sunlight), holding the frame in the left hand, and with the right keep something quite opaque moving just over the joining of the clouds with the view, otherwise you will find your print entirely spoiled.

Photographing Clouds.—The best place to obtain these is from a well elevated position or at the sea-side, and the time of year best suited is the spring, when the clouds are at their best. Oftentimes a very nice and effective one is to be had on an autumn evening towards sunset. *Exposure:* It is as well to use a small stop and give a fairly quick exposure, particularly in the spring, but not so quick in the latter part of the year. *Development:* An extra quantity of bromide should be added, and a small portion of ammonia or other accelerator used.

Films for Cloud Negatives.—The advantage of films over glass for cloud negatives is for the simple reason that, being reversible, they can be used from either side, hence combining two clouds, so to speak, in one.

IN SHAKESPEARE'S COUNTRY.

BY SIGNOR ASPA.

Piping Pebworth, Dancing Marston, Haunted Hillborough, Hungry Grafton,
Dodging Exhall, Papist Wixford, Beggarly Broome,
and Drunken Bidford.

MY paper on Drunken Bidford, which by the courtesy of our good editor found a place in last year's annual, has brought me several inquiries about the other places characterized in the above lines. Recent outings have improved my acquaintance with these interesting villages, the first two of which shall now be described. The rest, if all goes well, shall have due justice done them next year.

It should be premised that these villages are only part of a group, clustering thick on the road, or near it, between Stratford-on-Avon and Evesham. The amateur in search of the picturesque should see as many of them as he can, for no two are quite alike, and each has its good points.

Within easy walking distance of Bidford are Binton, Weston,

Welford (described in last year's annual), Dorsington, Marcliff, Cleve, North, South, and Middle Littleton, Salford, Arrow, Barton, besides the mediæval towns of Evesham and Alcester—the latter standing on what was once a Roman city. Adding these, and perhaps a few hamlets, to those celebrated in the doggerel, one may see what a wealth of material for the artist or the photographer lies here in small compass, nearly all the places named being as noticeable for actual beauty as for antiquarian interest.

Pebworth and Marston may be visited very comfortably from Leamington or Stratford by taking train to Honeybourne station, on the Great Western line to Worcester. Here, were I free to wander from my subject, I could tell how Evesham, full of historic interest, is but six or eight miles away, on the same line; and how Broadway, the adopted home of some famous American artists, is but a short drive distant. An account of all the places worth seeing in this district would, however, more than fill the ANNUAL.

The most pleasant way from Honeybourne to Pebworth is by the fields. It passes over high ground, whence the Broadway hills are seen to advantage. If the day is clear a "shot" or two may be spent on anything making good foreground—fallen trees, sheep, or cattle, the hills standing for chief "motive." On these hills a tall nondescript structure will be noticed, which, because perhaps it is unlike anything on earth, is called The Fish!

S. Aspa.

PEBWORTH CHURCH.

One enters Pebworth, this way, by a field with good cottages on its far side. Here is one. There are more, equally good; and

Parish Church, Musbury, Eng.

Engraved by
KILBURN & CROSS,
Boston, Mass.

broken places weedy patches, and suchlike "accidents," will be easily found for foregrounds.

S. Aspa. COTTAGE—PEBWORTH.

The church, which is well placed on top of a hill, is said to contain an interesting old painting, dated 1629, having reference to a family named Martin.

Having done with Pebworth, it will be best to get a guide to show the field path to Long Marston, a walk that on no account should be missed; for it will be hard if some very pretty bits of landscape are not picked up on the way.

S. Aspa. PEBWORTH CHURCH.

As the railway station at Long Marston is but ten minutes' walk from the village, all the time at command may now be devoted to securing a representative collection of Warwickshire cottages, this place offering a great variety.

Cheerful, not to say sprightly, invention marks, to my mind, the village architecture of this neighborhood; remains of fine old churches and priories abound, and it is but reasonable to suppose that the clergy, so proud of their genius

in building on a large scale, would also take pleasure in designing homes for the peasants who tilled their lands.

S. Aspa.

AT PEBWORTH.

Judging by the epithets "Piping" and "Dancing," a lively air must have pervaded, at least, the two places we are considering, in Shakespeare's time, though there is good reason to believe they must even then have worn a fair look of antiquity. Here is a cottage that may well have been reared while the Confessor was King. Here is part of a range having mud walls and thatched at one extremity and part of a pre-Reformation Church (used now as a dwelling); at the other there is a small Manor House, very old, but beautifully designed and built.

S. Aspa.

BY THE WAY.

This in all probability is of much earlier date than the desecrated church referred to above, and, contrasted with either of them, the modern Parish Church is a wretched thing; a poverty-stricken look being, indeed, its chief characteristic. This village, as compared with others, may well be called

"Long," its length being probably one-third of a mile. On either side, paths and alleys lead to pretty bits, and to cottages so varied that an enthusiast will not know when to cease taking them.

S. Aspa.

PART OF DESECRATED CHURCH; NOW A DWELLING HOUSE, AT LONG MARSTON.

And here is a barn with a stone roof about which some particulars that may interest curious readers were given me. The stone is of very marked stratification. It is quarried, at right angles to the strata, into blocks the size of the tiles desired, and, just as a loaf may be taken to represent so many slices of bread, so each

S. Aspa.

OLD MANOR-HOUSE, LONG MARSTON.

block is considered as representing a certain number of tiles. But to split up the blocks by hand would require skilled workmen, and would be costly. They are placed therefore on their sides so as to be soaked through by rain, and in this state frost, when it comes, splits them up so completely that very little labour is required to separate and trim them ready for use. Holes are then bored, through which by the aid of oak dowels they are attached to the rafters, and, when laid in cement, they form an excellent and long-lasting roof. That in the illustration is said to be more than 300 years old.

S. Aspa.

STONE-ROOFED BARN, LONG MARSTON.

This village is much visited for the sake of an old mansion near the church where Charles II. slept one night, disguised as a servant to Mrs. Lane.

S. Aspa.

MANSION WHERE CHARLES II. SLEPT, LONG MARSTON.

It is too much the fashion to pass the poor people of these country places with but a glance, and without a thought; and it is not surprising that they have learned, in return, to regard strangers with dislike and distrust. The amateur photog-

rapher has a better chance of breaking through this antipathetic feeling than most others. My own habit is to be always well provided with coppers, and to give one to every child who sits for me. This soon creates an interest in a small place, and the operator will find no lack of figures if he requires them. But if a child is known to have been "took," the parents are interested at once, questions are asked as to how much would be the charge for a copy, and when one has explained that the pictures are not done for money, and are too small for the faces to be recognized, the look of disappointment has been, more than once in my experience, so distressing, that I have "taken the babby" on the usual carte scale, and have made some friends for life.

One word more. It sometimes happens that a subject presents itself on ground where strangers may not go without permission. But to explain one's wishes, in order to get leave, may possibly involve much loss of time, or it may promise to end in one's being laughed at. This was exactly my predicament in the last illustration. 'T was done in a flash in a place where Trespassers were bidden to Beware; and no one knows of the incursion but the donkey!

S. Aspa.

ON FORBIDDEN GROUND.

PHOTOGRAPHING ANIMALS.

BY NICHOL ELLIOTT.

ANIMALS generally are very timid subjects, and one is never sure of their keeping still when being photographed. This being the case, a shutter exposure is necessary. The shutter should be adaptable to various speeds, and also to work silently, at least till after exposure, because the least click in releasing it is apt to make the animal move just at the wrong time. The shutter should also have a pneumatic release, so that one's whole attention can be given to the subject.

Animals can be taken well out of doors in a bright light, and if a small animal is being taken, such as a cat, it should be raised up so that the camera does not require to be tilted too much.

To get good results there should be plenty of contrast between the animal and background. As to backgrounds, an ordinary blanket serves well for a very light one, and a brown paper, or cedar felt, for darker ones.

Have everything ready before placing your subject; put something in the position it will occupy, and focus; then place your animal in position, and, having your shutter set at about one-tenth of a second, watch your opportunity, press the ball, and, if you are a careful worker, you may be pretty certain of a good result.

MOUNTING GELATINO-CHLORIDE PAPERS.

BY FRED. H. DAVIES.

THE extensive use of gelatino-chloride papers has made the mounting of photographic prints a far more difficult task than in the good old days of albumen, and there is no doubt (retrograde step though it seems) that if a really good brand of sensitized albumenized paper were placed upon the market, many workers would prefer its use for this reason alone.

It is not within the province of this article to discuss the merits

or demerits of papers with a gelatine base, but simply to give a few hints as to the best method of treating such papers so that mounting may be neatly and expeditiously performed with a minimum of risk to the film.

It must be understood at the outset that gelatine, from its very nature, will not stand the handling that old workers were accustomed to give prints on albumen; therefore, in the toning and subsequent operations, every care should be taken that the prints are touched by the hands as little as possible, the washing being preferably performed with a syphon washer. In very hot weather the difficulties are much increased, and a few lumps of ice put into the water will be found of great assistance in preserving the film intact.

After the prints have been taken from the toning bath, they should receive a slight rinse in clean water, and then be immersed in a toughening solution. Many formulæ have been recommended for this purpose, the chief ingredient as a rule being sulphate of aluminium and potassium—the double salt of aluminic sulphate, commonly known as alum potash. This, however, the writer has found far less efficacious than the pure salts of aluminium. The best of these is undoubtedly aluminic chloride, but this, besides being rather expensive, is deliquescent, and therefore difficult to keep. The more convenient salt for the purpose is pure sulphate of aluminium, and this should be mixed in the proportion of about one part of aluminium to seventy parts of water, a little more or less making no perceptible difference. It can be used over and over again until it loses its power, or becomes turbid, when a fresh solution should immediately be prepared, or stains will result.

After ten minutes' immersion in this bath, the prints should be rinsed, then fixed and washed as usual, when their former sticky nature will have quite disappeared, and they may be treated in much the same way as a print on albumenized paper.

Those workers who have many prints to mount will do well to take them out of the water one by one, and lay them in a pile, face downward, on a sheet of plate glass. A roller squeegee passed over the pile a few times will remove most of the superfluous moisture, and a few minutes' draining will do the rest. They may then be pasted, placed in desired position upon mount, and rubbed into contact. A good plan to do this effectively is

to procure a sheet of waterproof parchment paper (the cheap kind used for covering preserve jars is excellent for the purpose), and, placing this over print, rub down with a wooden instrument similar to that used for mounting crystoleum prints. It can easily be constructed out of an old boxwood rule by the aid of a sharp penknife, and will be found of great use for removing superfluous paste—the parchment paper being interposed between it and the print, preventing damage to the latter. The ends of this instrument are bevelled and the edges rounded with glass paper.

Just a word as to mountant. The tendency to thick papers has made it necessary to employ a stronger paste than was at one time used. There are many good brands of mountants now on the market, but a paste that will answer most requirements can be made from a good quality of cornflour to which is added two minims of oil of cloves. The brush used should not possess a metal mount, as the latter is a most fruitful source of tears, and after being used a few times becomes rusty and spoils the paste. A most useful brush for the purpose is that known as a sash-tool, No. 2, which will distribute the paste better if it is shortened by cutting the bristles.

SOMETHING NEW.

By George Kilburn.

WHAT an age is this in which we live! What an advance on all past ages, in almost all sciences! Every day reveals some new discovery. Yet the cry still goes up for more. Alas, how insatiable is the human mind! To try and appease those still in want of something new, I wish to draw the attention to another process for decorative or transparency purposes. It is called "Albumen Stripping-Film Paper," and has been placed on the market quite recently. The method of working is the same as most print-out papers. Printing must be allowed to go on until the shadows are bronzed. Toning can be done by any favorite bath according to color desired. Any tone can be obtained by using different baths. For black tones bicarbonate of soda, for rich purple tones phosphate of soda, is recommended. I have got a nice warm color by slightly toning

An Ice Party.

Photograph by RÖSCH, White Plains, N. Y.
Engraved by
ELECTRO-LIGHT ENG. CO.,
409 Pearl St., New York.

in a borax bath, and then fixing as usual. After toning and fixing, they must be well washed, and whilst wet transferred to whatever is to be the final support. The prints can be transferred to glass, porcelain, opal, or other articles. After the prints have become dry—undue heat must not be applied—place in hot water, or when an article cannot be put in water, this may be poured on to the print. When the print has got thoroughly soaked, raise the paper at one corner with a knife-point; the support will readily and easily leave the film. For clear shadows, coat the transparency with varnish, when the fine granular appearance (if objected to) will disappear. For decorative work this will prove a simple and easy method at a small cost.

MERELY A MATTER OF TASTE.

A DIALOGUE.

By Matthew Surface.

Process. By the way, did I tell you that latest dodge of mine in vignetting? You cut the vignette out of a piece of tin, you know.

Art. Of course, but I rarely if ever vignette my photographs.

Process. Just so; these things are merely a matter of taste. Still, if you ever do vignette, just give tin a trial.

Art. These are some of my recent photographs. Do you care to look at them?

Process. Hem! that 's very fair, a good idea, but your lens must be a bad one. It does not seem to cover the plate properly to the edges, or perhaps it is that you have used too large a stop?

Art. Well, I rather flattered myself that was a good effect. If the details are sharp up to the very edges, there is a tendency to lead the attention off the main subject, to distract it and prevent a real appreciation of the subject.

Process. Well, that may be so, but I certainly have never thought of it in that light. And how rough your

paper is! It looks as though you had made it yourself. Why don't you use a decent make, such as Smith's Highly Glazed Aristotype? I like to see that gloss, besides look at the detail you can get.

Art. Gloss! my dear Sir, I abhor gloss. Nature is not glossy.

Process. Well, I always thought the high finish was desirable. You upset my notions. But then look at your toning. It is obvious you are economical with your gold. Why, the prints are as brown as berries. Now, I like a good purple grey. But, if it 's a fair qustion, what plates do you employ?

Art. I've used Brown's ever since I took up photography. I don't think it matters very much what make of plate you use. They are all pretty good. But since you object to my lens, my paper and toning, come now, what say you to the mounts?

Process. Well, you will excuse me, but they look like nothing but common brown paper, such as the draper wraps his parcels in. Now I prefer a good broad white mount, with a neat red line round it, and perhaps Oxford corners. Of course my mounts would be more expensive.

Art. Well, you know I abominate the Oxford line, not only because everyone uses it, but because the contrast of the white mount, the red line and a grey glazed print is in my mind horrible, glazing, screaming. I should feel as though the photograph were hitting me on the head every time I looked at it.

Process. That is your imagination, or perhaps it arises from indigestion.

Art. You are right in your first remark, but wrong in your second. It may be imagination, but I have always thought, rightly or wrongly, that imagination played an important part in photography, and I hope I am not boring you if I explain my views on this matter. An ideal photograph to my mind is one which tells a story, but appeals as much to the mind as to the eye; suggests something, but does not set it all out all diagram-like in black and white. A little mystery is a relief; if

you give nothing but hard, bare facts, you lose the inherent poetry. As to the paper, it ought to be suitable for the subject, and the mount should be in sympathy with the print, not in antipathy to it. The whole should be restful to the eye, not dazzling.

Process. Well, there may be truth in what you say. These things seem to be merely a matter of taste, and I confess I have never thought of them in that light. That just reminds me—have you tried those new rapid plates of Jones'? I get fine results with them by exposing for one-fiftieth of a second, and developing partly with amidol and partly with metol, but you must be careful to pour the former on before the latter or you lose detail. The next time you are down our way, look in and I will show you some of my negatives—they are awfully brilliant.

Art thinks he will pass by on the other side.

CLOUDS.

By H. Crisp.

ON several occasions lately, opportunities have occurred (which I have taken advantage of) when out with the hand camera for securing cloud effects. As this is a new field to me, perhaps a few of my experiences in that direction may be of interest to some of the numerous readers of the ANNUAL. The illustrations shown were taken with a box hand camera of German make, having R. R. lens, scale for focusing, finders, and shutter giving time or instantaneous exposure. In each case the camera was held in the hands and an exposure given of one-fiftieth of a second. The plates used were by several makers, but of slow speed, as I found it easier to get the necessary contrast with an ordinary, than with a rapid, plate.

The negatives were dodged in development, the foregrounds being forced up, while the clouds were retarded by keeping the solution off those portions and just giving an occasional swish all over the plate, the straight horizon lines making such manipulation easy. Several developers were tried, but the one considered most suitable is the following:

H. Crisp.

COMPARATIVE PICTURES SHOWING VALUE OF CLOUDS IN A PHOTOGRAPH.

No. 1.	Soda sulphite	4 oz.
	Hot dist. water	4 oz.

when cold add sulphurous acid 3½ ozs., and pour the whole into pyrogallic acid one ounce.

No. 2.	Potassium bromide	2 drams.
	Ammonium bromide	1½ "
	Ammonia	7 "

Make up to 5 ozs. with dist. water. For use take No. 1, 1 dram; No. 2, ½ dram; water, 2 oz. More of No. 2 solution may be added if required. This developer works slowly and is well under control; density to any extent may be obtained, and it is impossible to produce fog by its use. A ten per cent. solution of bromide of potassium is handy to retard development in parts by painting same with a soft camel's-hair brush charged with the solution, care being taken to keep well within the outlines of the parts it is intended to retard, as the bromide solution spreads freely. The illustrations shown were taken purely for the cloud effects, the time being near sunset, and the exposure being made while the sun was hidden, or partly hidden, behind the clouds. As a help in picture-making a comparison of the two yacht views should be instructive; the one with a bare sky, although crowded, seeming only half filled and unsatisfactory, while the other, with a fine bank of clouds filling the upper part of the picture, satisfies the eye at once. I hope later on to try some orthochromatic plates with and without screens, etc., and, should results warrant it, will be glad to contribute same for the general good.

PERSPECTIVE IN DRAWING.

By H. W. Studley.

THE same old subject so often spoken of, but, if rightly applied to all free-hand drawing and especially to sketching from Nature (the most fascinating of all art work), one of the most fruitful rules the delineator has to contend with.

At first quite subtle, never to yield unless you follow exactly its true aim; then to your entire satisfaction you view your sketch or drawing only to find its converging lines assuming beautiful shapes corresponding in a

remarkable degree to those of nature to which every artist should closely cling.

Some few, and I might well say thousands, do not apply this grand and sure rule except upon drawings of buildings and like figures constructed of perpendicular and horizontal lines. As true as we see the sun day by day, there is not a solid body but one can detect upon it some line or indication of the applied rules of perspective. It is most truthfully applied to landscape drawing and painting to represent the gradually receding distance, is sought for upon a row of buildings or some lofty ledge of rugged rocks.

The same pleasing appearance is manifest when looking upon a winding river, its curving banks receding, the eye ever changing as one sees the imaginative process already pictured out thereupon.

It is aptly applied to all household outfittings. There is not an article about the house that can be perfectly drawn (otherwise than a flat working drawing) without the untiring aid of invisible perspective lines.

All of our lovely and most beautiful flowers, each and every one, can most readily be laid out and drawn within the lines of exact perspective by any skilful artist.

The circular disc, the round ball, or our own earthly globe, as represented with its imaginary zone lines, is a fair representation of the result of understanding the law of this well-worn rule.

There are quite a number of rules of perspective that can be applied which answer very well as a store-room for the artist to rely upon; and, if well versed in these helpers, he can feel at once a certain strength that otherwise would be found wanting.

True, there are certain rules found in text-books that the every-day artist might not use and yet get along very well indeed. A rule so generally applied, and yet so little understood, really must not be carelessly overlooked. A pupil once remarked to me when I told her that her drawing of a bridge was very much out of perspective, " My last teacher taught me that perspective was used but very little, and not to bother my brain at all about that.' In one sense her instructor told the truth, in another she misguided her wofully. Most all rules at sight seem dry and uninteresting until we become accustomed to their ways of winning, so let us all take a hand in working out our own part in whatever station we are placed, making this world and its several callings easy and comfortable for all toilers, whatever their craft may be.

A REVIEW OF PRACTICAL PHOTOGRAPHY.

BY JABEZ BOOTHROYD.

HAVING had considerable experience since I wrote my last paper on how to produce good negatives, I thought it would be both interesting and instructive to many of your readers to give a review of the necessary and practical part of Photography by which that most desirable result may be attained, the producing of good negatives.

The first thing of importance is a good light-tight camera, so that no light, except that which passes through the lens, may gain admission. The slides that hold the sensitive plates should be as perfectly light tight as it is possible to make them, and I find the solid form of slide to be the best. I have used that form of slide for nearly two years, and have not had one single fogged plate all that time. They are also quite as light, but ten times as strong as the ordinary book-form.

The next part of a photographic outfit (and the one that I consider the most important) is the lens. It is the lens by which the photographer is enabled to obtain a correct picture of the object that he wishes to photograph. It is therefore the most economical to procure the best lens that you can possibly buy.

Having obtained a perfectly light-tight camera and slides, also a firm tripod to support it, by a careful use of these you need have no fear of the result.

The next requirement will be sensitised plates. Of these there are variety enough to satisfy the most fastidious. They are made of ordinary, rapid, and extra rapid sensitiveness, but I recommend the ordinary, as they give a much greater latitude in development, and the greater latitude in development is, in my opinion, of far more importance than what is called rapidity; for by careful, slow development you may do almost anything with a good ordinary plate. Whatever kind of plates are used I strongly recommend that they be backed. There are two reflecting surfaces in every glass plate, and the angle of reflection of the back is different to that at the front; it is therefore necessary to destroy the reflection of the back surface or reduce it. To accomplish this purpose I back my plates with burnt sugar. Burnt sugar reduces

the reflection of the back surface of the plate ninety-five per cent., which I think is quite near enough. I find it is the best to use it without mixing it with anything else. It is also most effective if the plates are used as soon as possible after being backed, and whilst the backing is moist. It can easily be put on with a sponge as thin as you like, and does not need to be washed off before developing, as it will do no harm to the developer. If the backing should get dry before the plates are used, it can be moistened with a damp sponge.

Next comes the exposure. This with many is a most important point, and, as they think to insure a correct exposure, they use photo-meters to test the light.

I ask, is it possible to obtain a correct exposure? If it is, then every part of the object to be photographed must be equally lighted, which I think in most cases is almost impossible. Photometers I think are unnecessary, as the light in which the photographer is standing, whilst testing it by his photometer, is not the light that passes through the lens and affects the sensitive plate, but it is the same light that illuminates the objects that are to be photographed, and those objects reflect that light, and that reflected light passes through the lens and is directed by the lens and thrown upon the sensitive plate. This reflected light impresses every detail of those objects upon the sensitive plate so far and definite as the surrounding light has illuminated those objects, and according to the strength of the reflected light that passes through the lens and is thrown upon the sensitive plate. According to the strength of the light reflected from the objects to be photographed (and not the light surrounding the photographer) will be the impression made upon the sensitive plate; so that it may be developed into a good or inferior negative, or show whether it can be made into a negative at all or not. The photometer can only give the strength of the surrounding light at the time it is being used; it cannot give the strength of the reflected light from the objects being photographed. The photographer will after all have to judge from the image presented upon the ground glass as to its strength.

After having exposed the plate then comes the great tug of war—to develop it; for it is in developing the exposed plate that all our skill is required. All previous operations are as nothing to this. If any reasonable exposure has been given (unless un-

Lillian Russell.

Photograph by AIMÉ DUPONT.
Engraved by the
BOSTON ENG. & MCINDOE PTG. CO.
113 Purchase St., Boston, Mass.

der or very much over-exposed), with careful development a good negative may be produced. To do this proceed slowly; never be in a hurry. Whatever kind of developer is used, and there are many developers, one can get good results from one developer, and others from another. I myself consider that pyro and ammonia is the best all-round developer; I use it for both negatives and positives except on paper, as pyro will stain paper. The last three or four years have convinced me that there is nothing like pyro and ammonia.

The following is the developer that I have found to be the best:

STOCK SOLUTION

Pyrogallic acid	1 ounce
Ammonium bromide	$\frac{1}{8}$ "
Potass. meta bisulphite	1 "
Distilled water to make altogether	$7\frac{1}{2}$ ounces.

Dissolve the meta bisulphite and bromide in part of the distilled water before adding the pyrogallic acid. To one ounce of this stock solution add 20 ounces of water, and to every ounce of this last solution add 2 drops of strong ammonia to commence with, and add drop by drop afterwards as required.

"HAIVERS" MAYBE.

By F. Dundas Todd.

JUST as I was beginning to get tired of photography, it fortunately happpened for me that Dr. Emerson published his book on Naturalistic Photography. Having learned to expose a plate, print, tone and mount a print, I concluded that I had acquired the whole art, and, seeing finality in it, came to the conclusion that it was a failure, for I wanted one that would last me a life-time. But Dr. Emerson's work turned my thoughts in a new direction, and the more I study the artistic side of photography the bigger the field seems to grow. Assuredly I have found a hobby that will keep me busy, even though I should exceed Methuselah in length of years.

Photography is a many-sided art, and each side has many subdivisions. I like taking one at a time and following it up till I can grasp the main principles that govern it. For some years the

F. Dundas Todd.

STUDY IN LIGHTING.

F. Dundas Todd.

" Tho' free from business cares and toil,
He haunts the old desk still ;
While visions of the bye-gone days
Go trooping past at will."

problem of lighting, artistic lighting, is the one I have wrestled with. First I studied how a landscape should be lit to get the best results, but, before I arrived at the solution, circumstances forced me to study buildings, and, after making five or six thousand negatives, I came to the conclusion that in a building the shadows should be thrown towards the operator—in other words, see that one side of the building, and one only, is in shadow, and every detail will show.

For a year I have been studying how to light the human face to bring out all that is in it, and that means of course to produce a perfect likeness. The editor knows my hobby and commands me to send him specimens, but I am compelled to confess that I have none of my own that satisfy myself. His orders must however be obeyed, and so I unpacked my camera and asked one of the gentlemen in the office to come nearer the window and play the victim. The portrait I send the editor, which possibly he may reproduce, represents my old friend as I know him. A resident of Chicago for sixty years, in his time he has seen many changes. During that long period he has never failed to call on his sister on New Year's day, and in that respect I feel sure he has scored a record. For this reason alone he deserves to have his features reproduced and handed down to posterity.

Both being in the humor, we made another venture. The old gentleman has the misfortune to be almost blind through old age—he is now seventy-seven—but each day finds him at his desk, whence he radiates a humor and a cheerfulness that is infectious. This tendency to keep in the old groove I tried to illustrate, and have sent a print to the editor.

In my efforts to study the lighting of the human face divine, I have been fortunate enough to sit at the feet of that past master of photographic art, Mr. James Inglis, and that my readers may feel just a little bit grateful to me should they wade thus far, I send also one of his studies, in hopes that it may set them to thinking as it did me. I heard two of his pictures get a rare compliment the other day when a lady remarked, "I like these—they look like men."

This brings me to the end of my "haivers." What 's "haivers?" you ask. If you can't guess, inquire of some Scotch friend, remembering always that the imagination should have some play, especially in matters of art.

REFLECTIONS.

By M. W. Thompstone.

AS I sat one day thinking as to what I should write on for the ninth volume of the INTERNATIONAL ANNUAL, and of the many changes which have taken place and are still taking place in this "Art-Science" of ours; on the increasing difficulty of choosing something original on which to write, a thought entered my mind that this would be the very subject for my paper—Reflections.

Perhaps I may be told that the present time does not admit of the exercise of this excellent quality; still, when we examine it more closely, how much the success or failure of our work depends on—reflection.

I am afraid we are all more or less sadly in want of this quality, not in our photographic work alone, but in many other ways; a few minutes' or even seconds' thought before an action will very often show whether it is for good or evil; so with words, many a quarrel causing untold misery might have been avoided by the exercise of a little reflection.

Stop! What am I writing? This is supposed to be a photographic paper, and here am I running off into a tone of moral reflection which will probably draw down on me some strong expressions on the part of my readers, should there be any, for I am afraid there are very few who take the trouble to read many of the articles; they toss the book to one side with the remark, "There's nothing new, it 's the same old things over again only put in a different way"; and there it lies untouched, until with other accumulated matter it is transferred to the flames or some waste-paper dealer.

I often wonder what those old pioneers would say could they but see the vast amount of printed matter devoted to the offspring on which they had lavished all their tenderest thoughts and feelings, had nourished, many of them, with their very life-blood, grown from a weak and sickly infant into a strong and blooming maiden, whose hand is ever ready to help her kindred sisters in the discovery of realms hitherto inscrutable to human eyes. Well might they wonder and say in the words of the poet Longfellow,

" Our hearts, our hopes, are all with thee,
Our hearts, our hopes, our prayers, our tears,
Our faith triumphant o'er our fears,
Are all with thee,—are all with thee ! "

Right nobly has she acquitted herself in her mission. Poor human mortals may strive and argue as to whether she belongs to Art or to Science; but those who love her for herself care not what she is. To many a poor soul has the sight of a portrait of some lost loved one been a comforter; many a young man alone in some foreign land has blessed the sight of home faces produced by her means, and which has raised up memories of happy times long past.

"It 's only a photograph," was the expression I once heard used in reference to an exquisite little gem by one of our noted photographers; "only a photograph" it might be, but it told its story equally well as its more expensive rival produced with the brush.

Who has not experienced the delightful recollections produced by photographs of our past holidays—scenes visited under conditions which will never occur again?

In conclusion I would say to all—reflect, be it only for a second. In the taking of a photograph it will save many a spoilt plate and the expenditure of energy in a direction and manner that could well be dispensed with; then, as time goes on we shall find our work improve and rise nearer the ideal attained by some of our co-workers, whose success has been brought about by the exercise of— REFLECTION.

CLOUDS IN LANDSCAPES.

By H. W. Hales.

WHO has not often looked up at the masses of beautiful clouds and wished he could get them in his photographs? And who also has not often tried it, with not the best results? Many expedients have been resorted to to obtain the clouds on the plate, and many directions have been given on the use of color screens, shutters, etc., and although there is nothing new in what I have to offer I am convinced that

a large number of photographers do not use it as it can be used. I refer to that much-abused article the lens-cap. By proper manipulation much may be done, and the careful, thoughtful man may by its aid produce pictures that cannot be had, perhaps, by any other means. In a landscape there is usually some part of the view that is apt to be over-timed, and that part is usually the sky and distance. In taking the cap off the lens, therefore, it should be lifted off the bottom first—almost as if on a hinge; move the cap slowly and gradually until near the horizon line, and then expose the sky as quickly as possible and recap the lens. Study your foreground and sky a little before beginning, and you will be surprised what excellent results you will get in the negative. Before moving the cap, it will, of course, be necessary to loosen it slightly, and care should be taken to avoid shaking the camera, but these points will readily suggest themselves to the reader.

PHOTOGRAPHING TUBES OF CULTIVATIONS IN GELATINE.

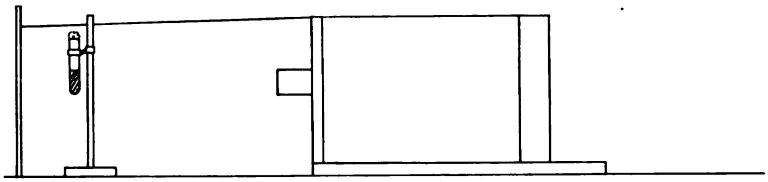
By Colonel J. Waterhouse, I.S.C., Assistant Surveyor-General of India.

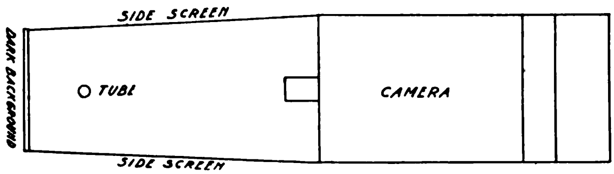
A FEW years ago I was asked by a friend to photograph for him some test-tubes containing cultivations in gelatine of different kinds of comma bacilli. The gelatine was perfectly transparent while the cultivations were semi-opaque and more or less funnel-shaped.

The difficulty was of course to avoid reflections on the surface of the tube and at the same time bring out the delicate structural detail of the different growths of bacilli.

After a few trials I found that quite a special system of lighting was required, and that the best results were obtained with an oblique light coming from behind the tubes so as to light up the contents—the tube being placed in front of a dark screen as background and protected from all side and front light by side-screens extending on both sides from the camera to the background and rather higher than the tube. The following diagram will explain the arrangement more clearly. The tubes are held in a holder

so that the bottom part containing the gelatine is left free. A longish exposure is required, but the proper time will be best ascertained by trial; mine were forty to sixty seconds. Ortho-





chromatic plates, used without a yellow screen, but containing some picrate of ammonia, gave very good results, and were found better than plain plates.

"SPIRIT" PICTURES.

By William D. Farrington.

WHEN the editor's polite request reached me for "information on one of the many branches of our art-science," I was just suffering from a series of unaccountable pranks on the part of my camera, which caused me to consider the designation of photography as a science a huge piece of sarcasm. I was the victim of a peculiar series of unexplainable phenomena usually termed "spirit pictures," and all my researches into the science of optics have not yet explained to me the cause of my unsought results. One of the last of my troubles was a plate which developed a positive instead of a negative—the lights were white and the shadows dark. In consequence, when a reproduction was made I had a ghostly landscape over which a

The Echo.

Photograph by ARTHUR & PHILBRIC.
Engraved by
VAN NESS & LITTLEJOHN.
80 Fifth Ave., New York.

black sun cast light shadows, and the Ethiopian had violated all precedent by changing his skin to a pearly tint.

This peculiar series of circumstances brought to my attention a quantity of so-called spirit photographs, which were based on the same perversity of the instrument. The manner of making ordinary spirit pictures is well known to every photographer at all interested in experimental work, but, behind all this known and systematic juggling with the lens and plate, there lies a world of peculiarities not yet explained. These furnish matter for interesting speculation; stout specialists utterly decry them, while men of clear and sane minds, free from every tinge of mystical belief, are unable to explain the reason of such pictures.

All sorts of stories—strange, pathetic, and humorous—crop up when a search into spirit photography is begun. There is a tale of a sturdy sceptic who was turned into a trembling believer on developing a plate which bore not only an image of himself, but the dog that had been his boyhood's companion. More wonderful still is that of a man who makes the study of archæology his recreation. Standing behind his little golden-haired girl on the photograph was an uncouth, semi-human figure, such as scientists claim the palæozoic man to have been.

Another and not infrequent mystery which has happened to a number of amateurs is to have made two exposures before the same bit of landscape, and found in the developed pictures that the lights came from apparently opposite directions.

These peculiarities of the camera help to explain the much more wonderful photographs that are ostensibly taken by the spiritualistic mediums. A medium who made no claim to be a producer of spirit photographs is reported to have focussed his kodak on a nearby landscape one day. He was but a clumsy amateur at the best, and was highly astonished when the resultant picture showed the mountain on the left instead of on the right, where it should have been. This joke of the machine, which was paralleled in my own case by the transfer of lights, led this man to embark in the business of making spirit photographs. It will be remembered that, some time after, the Boston Camera Club investigated him.

At this investigation two members used their own cameras and plates taken from previously unopened boxes purchased by themselves. The medium only asked that after his own picture had

been taken there should be an exposure in the dark of thirty minutes. When this picture was developed it was found that the back of the chair in which the medium sat was outlined on his breast, as though he were transparent. This result has never been explained, and the medium is still doing a profitable business.

An European medium claims to produce pictures by holding a sensitive plate between his hands in a dark room of the house where the party whose picture was desired lived. The plates never went into a camera, but the images were distinct and definitely proportioned. This feat has frequently been attempted by American mediums, but it is relegated rather to the magician and prestidigitateur than considered as a photographic freak.

The mediums I have seen give a peculiar and not over-clear explanation of these phenomena. It depends entirely on certain well-known properties of light. In the time of Faraday it was shown that photography did not depend upon light as a whole, but on the violet or actinic rays. Pictures were taken with lenses which excluded all other rays, and the magnetic rays of a magnet suspended in a dark room were photographed. It is likewise a well-known fact that the lens distinguishes objects invisible to the keenest eye. The spokes of a rapidly moving wheel are plainly shown, and stellar photography has shown us innumerable stars unknown to astronomical observers. These actinic rays are also known to have the property of rendering magnetic steel on which they are concentrated.

It has long been claimed that there is a subtle connection between magnetic and spiritualistic phenomena, and the believers in this declare that actinic rays, invisible to the human eye, imprint on the surface of the sensitive plate the mask which stands behind the known sitter.

While this may explain the more abstruse instances to the minds of spiritualists, it hardly accounts for the peculiar phenomena which occur to so many amateurs, and which were so puzzling to me. The fact remains that there appears to be a certain set of conditions of light which change the usual laws governing photographic optics and produce results wholly at variance with the best established rules.

THE PERMANENCY OF SELLE'S COLOR-PICTURES.

By Dr. R. Neuhauss.

IT has been said about Selle's color-pictures which contain aniline color matters that they were of very little durability, as aniline colors bleach out very quickly when exposed to light. To clear up this point the writer made the following test: Several sheets of black paper were wrapped tightly around the one half of a Selle's color-picture (flowers) and this was exposed to light at a window on the south side for three weeks. During this time it was repeatedly exposed to the sun's rays for hours. When the wrapper was removed after three weeks, not the least difference could be observed between both halves of the picture. The colors proved to be constant to light in an extraordinarily high degree.

How is this peculiar appearance to be explained now? We have shown previously that by exposure of the picture film a chromic acid is formed, which serves as a tanning agent for the color bath that follows.

To this latter circumstance the pictures owe evidently part of their constancy to light. Quite a corresponding appearance we know of the coloration of bacteriæ. To make these visible they are treated with aniline color-matter. To make certain formations visible the preparations have to be tanned before being subjected to the aniline bath, and it is well known that the tanned preparations keep their color much longer than those not tanned.

Dr. Selle calls attention to the fact that those of his plates which he has coated with varnish are more constant to light than those that were not varnished. The picture which was used in the test by the author is varnished. We found Selle's assertion fully confirmed. A plate that was not varnished proved to be less constant to light.

We see therefore that the assertion that Selle's pictures could not be used on account of their containing aniline matter is unfounded. The pictures are at least just as much sensitive to light as photographic silver prints.

DIFFERENCE IN THE ACTION OF LIGHT UPON BROMIDE OF SILVER AND UPON CALCIUM SULPHIDE.

By J. Gaedicke.

IT is a well known fact that a surface which has been coated with grainy calcium sulphide, the so-called Balmain's luminous paint, will become phosphorescent in the dark after exposure to daylight; that is, it will continue to be luminous. But this diminishes gradually, so that after nineteen hours not the slightest trace of light will be visible. The coating has then ceased to be luminous, just as the strings of an instrument, which will sound for some time and cease gradually.

There is a way to effect a cessation of this luminous state in a short time, and this consists in the influence of red light. If the above mentioned phosphorescing surface, after exposure to white light, is covered—one half with a black paper and the other half with a red glass—and this is then exposed again, it will be found afterwards in the dark, that the half which had an after exposure through red rays is darker than the other half. The red light has therefore reduced the action of the white light. The question is now, if the effect of light upon bromide of silver is similarly exciting as upon luminous color, if a cessation takes place, and if red light reduces the action of white light. It cannot be said that the last question has a negative reply, because a too energetic action of the red light during development will fog the plate, and then it would always be possible that some grains of the emulsion would be sensitive to red light and some to light of a different color, and that the red sensitive grains were the cause of the fog, while the picture produced by white light would at the same time be reduced by the red lamp and be lost in the fog.

The question of the cessation of the latent picture is not sufficiently solved yet. It is a repeatedly observed fact, that collodion dry plates, having been preserved with tannin or other suitable substances, retain the light impression only for a very short time, so that only incomplete pictures will be produced if the development takes place several days after exposure. With gelatine dry plates the opinions differ. According to Guillaume,

the picture gains in strength within thirty hours and remains constant from two to three months. After that time it becomes weaker again and finally disappears. (See ANTHONY'S PHOTOGRAPHIC BULLETIN, 1893, p. 599.) Harding tells of a case (*Photographic News Almanac*, 1895, p. 216) in which totally under exposed plates, which were developed after two years, gained so much in strength that they gave good negatives. Bothamley (*Photography*, 1893, p. 665) considers the latent picture completely durable if not destroyed by bromide salts that may be in the film or by bad preservation.

We have therefore several sources according to which the latent picture seems to cease. To help solve the question whether the action of light upon bromide of silver was analogous to that upon luminous color, some tests were made to find out whether bromide of silver with regard to red light shows similar conditions as the luminous color—that is, if red light acts and reduces the impression of light of a different color.

For this purpose a glass plate of 6 x 9 *cm.* was pasted lengthwise with strips of pelure-paper, so that the first strip was covered with one, the second two, and the sixth six layers of paper. This so-produced sensitometer was divided vertically into three parts by three pencil marks, representing three adjoining scales. In the first case the strips were designated with 1–6, in the second with i–vi., and in the third with a–f. Under this sensitometer a dry plate was exposed—twice the first time by covering the field a–f with pasteboard and exposing the other two fields, 1–6 and i–vi—normally. Then the field 1–6 was covered with pasteboard and the other two fields were exposed to the red light 80 to 100 times as long as the first. The field 1–6 had obtained here normal exposure with white light, the field i. to vi. same exposure, and afterwards got the 80 to 4000 times exposure with red light, and the field a–f obtained only the exposure with red light. If the red light had exercised an extinguishing effect upon the picture produced by white light, the centre field i–vi would have to be weaker than the first field 1–6. But the development of both showed that it was stronger than the field with white light, and it could be accepted that it was as much stronger as the impression of the red light would amount to, which is seen in the scale a–f. Besides this, there was in the middle scale one number more marked. The red light has therefore not extinguished but has added an effect to that of the white light. The

experiment was repeated by making the first exposure through a green light and the second with the red lamp. The result was here the same: the effect of the red light had been added to that of the green light.

The colored light acts therefore differently upon calcium sulphide (luminous paint) than upon gelatino-bromide of silver. Another process than that with calcium sulphide seems therefore to be introduced by the action of light on bromide of silver.

The question, whether with the latent picture a cessation (interruption) of the light-impression takes place, or whether the conditions differ here from the light-impression upon luminous paint, still awaits a definite solution.

A completely stopped luminous color surface, covered to one half with thick pasteboard, and the other half with red glass, and exposed to the light of a magnesium band, is however also excited by the red rays and will become phosphorescent. The red light is therefore also an excitant by itself. But it does not act in an adding manner to the effects of white light, but in a subtracting way. The phosphorescence can therefore not be extinguished by red light, but only reduced. This is at all events a very curious fact. The strong dying away of the latent picture has been observed particularly with the daguerreotype and with the physically developable iodide of silver.

It appears therefore as if the latent picture in the gelatine emulsion owes its origin to a chemical process, although this has not been proven yet.

I send a film negative belonging to the second series of experiments and showing in 1–4 effect of the green, and in a–d that of the red light, while i–v shows the amount of both kinds of light. The film was stripped from an ordinary dry plate of the Berlin Anilin factory after Valenta's process (*Photo. Corresp.*, 1896, p. 321) which works very conveniently.

An interesting point of the negative is the different character of the manner of action of the red and green light. Both have an equally long tone-scale of four fields, but with the red light the picture is much softer than the green light, which is richer in contrast. If we suppose that in this case the energy of the red light was somewhat weaker than that of the green, the red rays must have a larger capacity to penetrate the dark paper layers, which agrees with the observations of the red light in fog.

PROJECTING APPARATUS FOR SHOWING MOTION ON THE SCREEN.

BY DR. R. NEUHAUSS.

IT is now about twelve years since Anschütz announced his first "schnellseher," with which he succeeded in a very complete way in uniting a series of views so that the object—for instance, a running horse—could be seen in its natural motions. For the production of his views Anschütz uses as many cameras standing close together as he intends to make views, generally twenty-four. The instantaneous shutters of these cameras are released by electricity within one to two seconds. This arrangement gives therefore but a limited time for all the motions to be taken. For motions occupying a minute or so at least one thousand cameras would be required.

The Schnellseher, as known, is so arranged that for the observation of the picture you have to look through a small opening in the body of the apparatus. At first Anschütz did not attempt to project the moving pictures enlarged upon a white-screen, as considerable difficulties were connected herewith.

The American, Muybridge, occupied himself likewise with the production of such views, and constructed an apparatus for their projection. He exhibited it at the " Urania " Club in Berlin, but many defects were apparent.

In 1894 Anschütz took up the idea again, to introduce his pictures by way of projection, and it was reported in 1895 that he had mastered all technical difficulties. The chief drawback was that, on account of the limited number of cameras, the series of pictures was too short. To make a change in this direction was Edison's effort. The introduction of films, which could be had in almost any length, facilitated his endeavors considerably. He constructed an apparatus which, provided with only one objective, has as picture-carrier a roll of film. That sounds very simple, but in reality the difficulties are great. During exposure the film is not permitted to move, because no sharp pictures—even at shortest time of exposure—could thus be obtained. But, as in order to have in the picture uniform motions, uninterrupted by stoppage, *at least* fifteen views per second have to be taken, it can be imagined that the solution is not an easy one. Fifteen times in a second

the film has to pass forward and stop again. Edison solved this problem in a magnificent manner. With his apparatus he was enabled to take a long series of pictures. To unite these pictures in the "Schnellseher," he printed the negative film upon a second one, which shows as a positive. The latter he fastened in an apparatus (kinetoscope).

Edison's pictures are about 2 *cm.* wide and 1⅛ *cm.* high; each strip of film carries from 600 to 700 views. These series of pictures represent the motions made within 25 to 30 seconds. The pictures are looked at through a lens which enlarges them a little. Edison did not attempt to project his pictures, as an enlargement by projection would show the pictures without sharpness upon the white screen, and only with great difficulty could the succeeding picture be put in the exact position of the preceding one. Anschütz in 1895 called attention to these difficulties. The very small pictures, as contained in the kinetoscope, hardly show this trembling motion to the eye of the observer, owing to their size.

To offer something new upon this field, efforts had to be made to introduce series of views with a considerable number of pictures in good projection. More than one scientist has worked in this direction during the last years. Lately the efforts of some have indeed not been without partial success, and progress can be seen. At present two instruments have been introduced to the public in Europe. One is the Kinematograph of Lumière, in Lyons, the other the Kinematograph after the French Irola patent. The inner arrangements, I have to remark, are not shown to visitors, but the arrangement of the Lumière apparatus is described in Eder's *Year Book*, 1896, pp. 391–400. Both apparatuses have an electric incandescent lamp as light-source for the projection. In both the pictures are on film rolls. The size of the pictures is about the same as Edison's (1½ to 2 *cm.*). The size of the projected picture is about 1½ to 2 metres. Regarding the arrangement of Lumière's apparatus, the German patent gives the following description:

The film strip is pushed forward by uniform turning of the roll, so that a fork with its prongs catches the holes at the edge of the strip, carrying the latter periodically along, but by a motion in opposite directions liberating the same again. Between objective and film is a window upon a rotating disk, which admits the taking of the picture or the projection of the same.

Portrait Study.

Photograph by RÖSCH, St. Louis.

Engraved by
HAGOPIAN PHOTO-ENGRAVING CO.
3 Great Jones St., New York.

We would mention here that in December, 1893, a patent was granted on an arrangement corresponding to that of Lumière.

Lumière Bros. say that they make fifteen views in a second and project the same. That is almost too little to obtain a smooth, not trembling, motion in the projected picture. But as the motions are smooth, certain authorities are of the opinion that Lumière prints the pictures perhaps twice upon the positive film, so that in the projection apparatus thirty pictures pass the objective in every second. That by such a process the trembling of the pictures can be essentially relieved is demonstrated by practical experience.

Lumière speaks of nine hundred pictures upon one strip in his circulars. A personal test with the second-clock has proven that the time for running off a series of pictures deviates between thirty and forty-five seconds. Therefore on one roll would be only from $15 \times 30 = 450$ to $15 \times 45 = 675$ pictures.

Complaint has repeatedly been made that at the exhibitions the handle which sets the roller in motion was turned too quickly and that the motions appeared to be too hasty. At all the exhibitions seen by the writer the apparatus worked with normal rapidity, and the motion left a natural impression.

How is it now with the solution of the most difficult problem —the exact fitting of the several pictures? We have pointed already to the fact that if a picture does not fill *exactly* the place of its predecessor, the total picture will move in all directions.

The Lumière Bros. solved this problem in a satisfactory manner. Still, even Lumière's apparatus is open yet to improvement. Regarding total effect and rigidity of the pictures, they surpass the Edison Kinetoscope that I have seen. To produce his series pictures, Edison constructed a stage-like place, on which the brilliantly illuminated figures set off from the dark background. This arrangement is wrong. If we have light pictures upon a dark ground in projection, the eye will catch much quicker the interrupted passages from one picture to the other than if the picture was light upon a light ground. Edison's arrangement was therefore discarded, and in preference sunny street scenes with application of a shady background were selected.

The trembling of the picture is also observable in the Lumière apparatus, particularly where houses and other immovable objects form the background. We see a fine picture; a fisherman in his

boat upon the high seas, the boat passing proudly through the rolling waves, everything faithful to nature; but the house that can be seen at the side moves to and fro as if shaken by an earthquake. Still more painful to look at is the wall of the Exchange at Marseilles, looking as if it was to tumble down every minute.

These defects can never be removed entirely. The producers of series views should therefore be careful in the selection of their objects.

Some of Lumière's pictures are extremely beautiful; for instance, their Aquarium, playing children, etc. The Irola apparatus has no such meritorious properties. The trembling of the pictures is much stronger, and the motions are not so rounded and smooth.

The opinion that the Kinematograph will soon take the place of the ordinary projection apparatus we cannot agree with. The above mentioned very considerable defects, which are tiresome to the eye of the observer, can hardly be removed. But we should not forget that only under great difficulties can such pictures be taken.

THE ADVANCEMENT OF PHOTOGRAPHY AND SMALL EXHIBITIONS.

By H. T. Duffield.

RECENTLY a stockdealer remarked in my hearing that the "amateur photographic craze" was dying out. While it is true that the "You jab the jigger and we 'll finish the mess" part of the craze is following the natural course of such paroxysms of national life, I believe that genuine amateur photography in this country is on the increase, for those who are now taking up the art seem to be imbued with a desire to make pictures (in the true sense of the word) and are not practicing photography as a plaything. The opinion of the stockdealer is based upon the fact that to-day he is not selling as much photographic material to the amateur as he did formerly. This falling off is accountable to two reasons—one being that many have found out that photography is an art that requires a considerable amount of knowledge and judgment, that simply

pushing a button does not insure good pictures, and these have dropped out of the ranks; the other is that we have been suffering from "hard times," and some of those who truly may be defined as amateurs have been placed in positions where they have had to decide between buying lenses, cameras, and dry plates and bread and butter and clothes, with the usual result in favor of the necessaries of life.

To realize that amateur photography is advancing instead of declining, one has only to compare the present with the conditions existing a few years ago. A great advance has been made in every branch of the art, and what was then considered good will not pass muster now. The amateur to-day is striving to make pictures, and not what may be termed pretty photographs, whose chief excellence was "sharp definition" throughout the whole negative. He is more careful in composing his pictures, even when doing instantaneous work. This change has been brought about, I believe I am warranted in saying, by the opportunities he has had in late years of seeing the work of distinguished photographers of Europe—men who have striven by work and by word to elevate the artistic side of photography. Their contributions to our exhibitions have been of the greatest benefit to our photographers, and as an instance of what I have said I mention the revival of carbon printing in this country, which I think is almost entirely owing to the showing of certain pictures at a Joint Exhibition of the New York, Philadelphia, and Boston Societies. While I fully acknowledge that the advancement of the artistic side of photography has received an impetus from the writings of learned authors, it is my opinion that these writings would not have been half so influential if we had been denied the chance to study their works. Take for example the writings of Dr. Emerson; while that gentleman presented his views in a plain and lucid manner, yet one could not have thoroughly appreciated all of his arguments if he had been denied the studying of the author's works. In all kinds of art it is what is done and not what is said that tells the tale.

As our amateur photographic clubs are organized for two purposes—to assist their members in advancing in the art and to enable them to do their work with convenience, the social features being incidental—there can be no better means of carrying out the first purpose than by frequent exhibitions of pictures and

lantern slides, and this is especially true when part of the exhibits are by persons who are not members of the organization giving the exhibition, for then comparisons can be made and the members can see whether they are in advance, stand equal, or are behind other fellow-workers, exhibitions of prints giving the better opportunity for such criticism. Now, it is often held that there is considerable expense and trouble involved in giving exhibitions of prints, but this is only so in those cases when clubs hold them on a "big scale." Halls must then be hired, a good deal of printing of circulars done, and prizes given—all of which entail considerable expenditure of money; and generally when a club has an annual exhibition of this kind it thinks it has done its duty. Consequently its members have only once a year the opportunity to see the work of others. The writer thinks that smaller exhibitions, held oftener and with less expense, would be far more beneficial. I know it is argued that eminent photographers will not take part in such exhibitions for the reason that prizes are not generally given; but I am quite convinced that the idea is fallacious, for men who attain high reputations in any art are usually sensible men, and who, fully understanding why they are invited to take part in an "at home" exhibition, would look upon the request as a compliment. Let any club when proposing to hold an "at home" exhibition send out invitations to our leading amateurs to take part, and I am sure they will find a ready compliance to their request. Of course, the outside exhibitors should not be expected to incur any expense for framing exhibits, etc.; these should be met by the invitors—the cost would be little. Indeed, the exhibits, if carefully handled, need not be framed, for one of the most interesting exhibitions I remember was composed entirely of the works of Mr. H. P. Robinson (owned by a member of the Boston Camera Club), which were simply mounted on cardboard. If I recollect correctly there were about sixty prints, and the exhibition was visited by many amateurs who studied Mr. Robinson's work with interest, and probably for the first time fully understood the beauties and possibilities of "double printing." For some years I have held the opinion that it would be a good plan if clubs would form a collection of prints (first-class ones) by their members for the purpose of loaning it to other clubs to exhibit. This collection need not be large in number of prints, but should be selected with judgment, nicely

framed, with full description of the picture on the back of each frame, and have a box made which would exactly hold the collection. This could be shipped by express to any part of the country, the receivers to pay all charges. I am sure many of our clubs would avail themselves of this plan of interchange, for it would add additional interest to an exhibition.

Too often the statement is made that it is difficult to frequently hold these small exhibitions, but to this I do not agree. When such are proposed, too often do we hear the assertion that "I have nothing to show," for the assertor thinks that he must put in a number of prints. Now it has been an unfortunate custom with us to crowd a number of pictures in one frame, when it would have been wiser to frame them separately, no matter how small in size they were, and thus enhance their appearance. If separate framing is the rule, every member of a club will find that he can take part in an exhibition, at very little more cost, as the frames can be used many times. Indeed, he may put in only one picture; and I recall a rather amusing incident connected with such an exhibit. A member of a club was prevailed upon to put in an exhibit if it was only one picture, he having asserted that he had nothing to show. It was a barnyard scene, a good subject and well done, and was much admired. His success prompted him to have it photo-lithographed (a few copies for himself having been struck off), and he gave to the lithographer permission to use the picture. That individual took advantage of it, and it now adorns an excellent brand of breakfast bacon. Merit often is its own and only reward.

THE PASSING YEAR.

By Walter Sprange.

THE passing year opened with very little prospect of any material advancement in any of the branches of photography, but has really proved to be one of the most fruitful years for the encouragement of the art student, as well as one of the most important years—since the first discovery of the principles of photography—for the investigation and experimental work of the scientist.

The large number of earnest workers in all parts of the world who are constantly endeavoring to accomplish pictorial effect, have been afforded material of a very valuable nature for thought and study, through the medium of the illustrated photographic journals, in the reproductions of the best efforts of some of the principal workers.

It is strange that the essential point seems to be the necessity of first becoming thoroughly versed in the accepted formulæ and conditions necessary to produce a perfect negative, and then to

THE OLD TUCKER WHARF, MARBLEHEAD.

ignore the same rules and conditions—so far as to studiously violate them by the exercise of care and judgment in the opposite directions; for instance, the substitution of pin-holes for lenses, the use of hypo in the developer, the exposure towards high-light, and the partial development of the negative instead of patiently bringing out the entire detail—all these violations of rules have, in the hands of studied workers, resulted in artistic work which has been most favorably accepted by the judges at the principal exhibitions during the passing year, and the class of

work referred to gives evidence of careful violations of rules, and the premeditated adoption of the methods by which the results were attained, which could only be successfully accomplished by those who have thoroughly grounded themselves in the first principles of the art-science.

Such productions as the beautiful prize-winning gems "Scurrying Home" and "Winter—Fifth Avenue," two artistic masterpieces of camera work,—the one taken in a very poor light, and the other during a dismal snow-storm in a city,—are both subjects

SKIPPER IRESON'S HOUSE, MARBLEHEAD.

for the thought and study of those who have ambition to excel in picture making. Several other examples presented during the past year in the photographic journals have well merited the laurels gained, and give evidence of the value of *latitude*—under the control of minds sufficiently trained by experimental work to bring into service all conditions of arrangement, exposure, and development; in this way the passing year has been more than unexpectedly rich in the materialization of the evidences of the great progress which is being made in the artistic feature of photography by those who persevere in their efforts.

The increasing number of conferences and exhibitions of the work of amateur and professional workers at home and abroad, have been of extraordinary value to both classes, in the opportunities they have given of affording object-lessons to those who have been able to attend them. So much so that in their arduous task the promoters of them should receive all the encouragement and assistance they deserve, for only those who have undertaken such work can fully appreciate the anxiety, labor, and exhausting nature of such undertakings.

FISHERMEN'S BEACH, SWAMPSCOTT.

The scientific feature of photography has received such an invaluable discovery, by the careful working out of a mystery which few would have noticed, that a substantial testimonial should be offered to Professor Röntgen by those who have profited by his discovery, for his broad and liberal manner of publishing it to the world at large, instead of reserving it and securing it to himself as many would have done.

My own personal efforts as a camerist during the past year have been confined to occasional hand-camera exposures, of a local char-

Gretchen.

Engraved by
GRAND RAPIDS ENGRAVING CO.,
Grand Rapids, Mich.

acter. The view presented of Tucker's wharf, Marblehead Harbor, is of interest principally for its historical value, it having been the place of arrival and departure from that port during the old colonial period, and still maintaining all its ancient characteristics. It is visited constantly by tourists, many of whom take the ferry from it to cross the harbor to Marblehead neck. The view of Skipper Ireson's house (the dark house in the centre) is of interest to those who have read of the very serious mistake the indignant ladies of Marblehead made, under the assumption that the skipper had

OLD FISH MARKETS, SWAMPSCOTT BEACH.

refused assistance to the crew of another vessel in distress, besides giving a very fair idea of the picturesque irregularity of the streets in this quaint old seaport.

Swampscott, which adjoins Marblehead, really abounds in beautiful scenery; its woods and lanes, meadows and rock-bound coast are unsurpassed in their variety of pleasing subjects for exposure. It has five distinct beaches, one of which has been monopolized by its fishermen ever since the first settlement of the white man on its shores. Fishermen's beach is constantly sought for studies of a character similar to that of the "Old Fish Markets, Swampscott Beach," by devotees of the pen and brush, as well as

by the camerist. All these old buildings will be removed before another season, the "squatters' rights" of the owners having been purchased by the town in order to clear the beach for a public park.

PRIMITIVE METHOD OF EMBARKING.

"TWO MEN AND A BOAT!"

Having no boat-landings on this shore, owing to the violence of the winter storms, those who desire to go boating have to be satisfied with the primitive method of embarking, of which a view is given. As a warning to other camerists, the result of a slight delay in changing plates in order to take a portrait of two men and a boat (to say nothing of the dog) is also given. Perhaps the attractive feature—to many camerists—offered on these shores is the almost innumerable number of charming "Mermaids," constantly appearing at the water's edge at almost all hours of the day, many of whom seem to rather like the idea of being photographed.

MERMAIDS.

COLORING COLLODIO-CHLORIDE PRINTS.

By J. Joé.

IT is the general belief—but without any reason—that collodion paper prints can only be colored with difficulty and incompletely. For years I have studied this question, and have come to the conclusion that collodion prints are the most suitable for coloring of all photographic prints, much better indeed than prints on albumen paper. If people do not succeed, their failure is to be looked on as due to want of suitable material and to wrong treatment.

The only suitable colors for this purpose are transparent albumen colors, and the best results I had with the latest albumen colors of Gunther Wagner of Hanover. These colors fill all conditions completely. All celloidin and collodion papers require, in consequence of their peculiar coating, a special treatment in coloring, which, however, is very simple. The color has to penetrate completely into the film, for only in this way can a smooth surface, great transparency, and extremely brilliant effects be obtained. For this reason it is necessary that the film be colored while in a moist state, as it resists (as is well known) all moisture and liquids after it has become dry.

The process is simply the following: The moist prints, to prevent their drying again, are put upon a layer of paper, so that they can be easily turned towards all sides. Now a brush is steeped in the liquid color and the latter is applied to the paper at the proper place. Care should be taken to keep each color within its proper limits, as the color which has penetrated the paper cannot be removed again. All superfluous color can be removed with a sponge or soft brush. The film appears now smooth and brilliantly colored. If the coloration is too weak, more color can be put on and the desired result will certainly be reached. Complementary colors are previously mixed in a little china dish. If two colors are to run into each other, like the red of the cheeks for instance, that part of the color taking the smallest place is first applied, and then the other. For portraits, the lips, the centre of the cheeks, etc., are colored first, and then the other fleshy part of the face, without regard to the previous coloring. A harmonious effect is obtained. Landscapes are treated in a similar manner.

The colors have very little body, and the photographic picture is therefore fully preserved, the picture possessing a gloss and a depth which cannot be obtained by painting with ordinary water-colors. As the colors contain much albumen, the picture can easily be burnished after mounting.

THE BRIGHTNESS OF THE CAMERA PICTURE.

By F. Paul Liesegang.

OF all the light emitted by a body only a comparatively small part will enter the camera during exposure. The number of light rays in activity for the production of the picture depends upon the distance of the object from the apparatus and the size of the objective-opening.

Photographic views, which we take, consist generally of opaque bodies whose radiation of light will not extend to more than about 180 degrees. Suppose such an object was to be photographed in a gallery, with a distance of 10 metres from the apparatus, the effective opening of the objective to be 10 centimetres diameter. In this case it is evident that from the surface of the hemisphere of rays of 10 metres radius only a part will come in contact with the lens system, which is cut out by the circular surface of 10 centimetres diameter. But this fraction is only $\frac{1}{80000}$ of the total light emitted, provided that the radiation is equally strong in all directions.[1]

If the picture is of the same size as the object, its brightness is equal to $\frac{1}{80000}$ of that of the object; but if the picture is smaller than the object, for instance M times smaller, the same volume of light for the production of the picture is concentrated upon a M^2 times smaller surface, and the brightness is therefore M^2 larger. If the focal distance of the system was, for instance, 25 centimetres for a distance from the object of 10 metres the image would be $\frac{1000}{25} = 40$ times smaller than the object, but therefore also $40^2 = 1600$ times brighter, than if of uniform size with the object. In comparison to the object the image brightness is then $\frac{1600}{80000} = \frac{1}{50}$; it is therefore $\frac{1}{50}$ of the natural brightness.

In this example (which is a favorable selection), $\frac{1}{80000}$ of the light rays issuing from the object will fall upon the objective. From this we have concluded upon the brightness of the picture under the supposition that the objective admits the passage of all light. But this is not the case. In the passage through the lens system a loss of light takes place in consequence of reflections on the surface of the lenses as well as by absorption in the

[1] Schroeder, *Photo. Optics*, p. 134.

mass of the glass and eventually in the layer of balsam serving for the fastening of the lenses.

If we have only small angles (to 30 degrees), which happens in many cases, the loss of light in consequence of reflection can be determined by the formula of Fresnel. Accordingly the brightness of light which passed through *one* glass surface is $J_1 = 1 - \left(\frac{n-1}{n+1}\right)^2$ and after passage through *two* surfaces, therefore though a glass-plate or a lens, $J_2 = \frac{J_1}{2 - J_1}$ under the supposition that the brightness emitted originally was equal to 1.

The volume of light which passes through the lens depends also upon the refraction coefficient n; for a flint-glass, as frequently employed, according to the above formula, the passing light volume J_2 will be for the rays of different colors:

Fraunhofer Line,	A	B	C	D	E
Refraction Coefficient,	1.6122	1.6157	1.6175	1.6224	1.6289
J_2	0.896	0.895	0.894	0.894	0.892

F	G	H
1.6347	1.6461	1.6562
0.890	0 887	0.885[1]

The more lenses an objective consists of, so much larger is naturally the loss of light by reflection from all the surfaces. If Canada balsam is used for the fastening of lenses, its refraction coefficient being almost equal to that of the glass, the reflections on the contact surfaces can be put down as equal to 0, and thus only the two outside surfaces of the combinations will come into consideration.

Considerably greater than the loss of light by reflection is the weakening of the rays by absorption in the glass mass. The extent of absorption varies with the quality of the glass. Particularly unfavorable are yellow and red-yellow glass, which absorb greatly the chemically effective rays. Greenish light reduces also the light effects considerably—oftentimes two to four times more than purely white glass. The loss of a certain kind of glass of 5 millimetres thickness at an angle of 60° of chemically effective light is 29 per cent., and of more favorable green glass 52 per cent.[2] The loss of light by reflection is included in the calculation.

[1] *Dr. Kruss:* About the loss of light of vari-colored rays in glass, Eder's *Year Book*, 1890, p. 45.

[2] Eder's *Year Book*, 1888, p. 48.

For the above mentioned flint-glass Dr. Kruss found the absorption factor at 1 centimetre thickness of the glass to be the following:

Fraunhofer Line,	C	D	E	F	G
Absorptive factor for 1 c.m.	0.969	0.967	0.952	0.893	0.860

For the more refractive rays the absorption is still greater.

Whether a lens admits the passage of light well can easily be recognized by holding it over a sheet of white matt paper, which is illuminated by white cloud-light. The paper has to appear then equally white (bright) whether looked at directly or through the lens. The balsam coating can also be the cause of the yellowish coloration of the lens; but this happens only with bad material.

With the number of lenses of an objective the loss of light by absorption increases of course, the same as the reduction of the rays by reflection. The total loss of light by passing through an objective may be accepted, according to A. de la Baume Pluvinel,[1] at an average of 20 per cent.; it can be determined with the aid of the hole-actinometer.[2]

The brightness of the picture is not the same at all parts. It decreases from the centre towards the margin for various reasons.

The marginal parts of the picture receive less light than the centre, the oblique bunches of rays which are admitted into the camera being smaller than the central one. This can easily be seen by putting the eye in place of the ground glass and moving it from the centre towards the edges. The circular opening it shows in the beginning will pass into an ellipse, whose large axis remains always the same—equal to the diameter of the opening—while the small axis decreases continually. The volume of light which is sent towards the several picture points is proportional to the effective opening which each time comes into consideration, therefore proportional to the surface of the ellipse, which is seen from this point. But these ellipses, their large axes being all the same, are related to each other like the small axes, and these again like the cosines of the angles of the bunches of rays. The intensity of these oblique bunches of rays varies with the cosines

[1] A. de la Baume Pluvinel, *Le temps de pose*, p. 17.

[2] *Photo. Archiv*, 1895, p. 216.

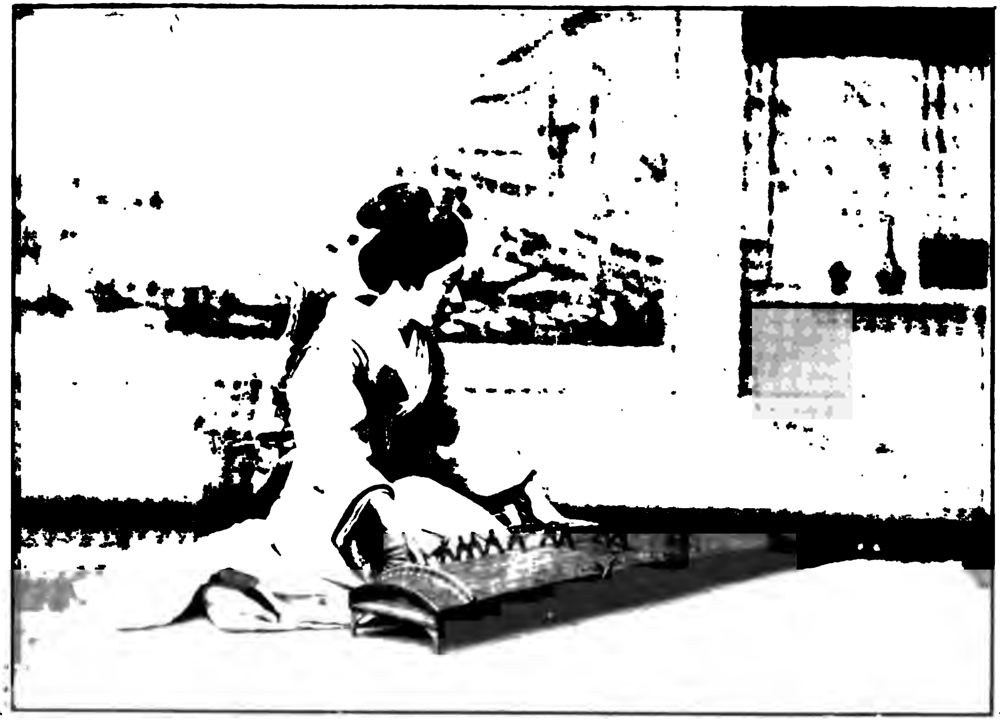
of their angle. If the light sensitive film had a convex form, the same as with our eye, all points of the picture would be equally distant from the optical centre, or, more correctly, from the second contact point of the lens system, and if the light rays were standing everywhere vertically upon the picture surface, the brightness at all parts of the picture would be in proportion to the intensity of the striking light rays—therefore in direct proportion to the cosine of the angle (α). But the sensitive film is generally of an even surface. As a consequence, the distance of the picture-points of the lens will increase towards the edge that is reversed proportionally to the cosine of the angle. But the intensity of the light will decrease in inverse proportion of the square of distance—decreases here, therefore, proportionally cos. $^2\alpha$. Further, the rays are standing not more vertically upon the picture surface towards the edge than in the centre; they spread upon a larger —$\frac{1}{\cos. \alpha}$ larger—surface, and their action upon the surface-unit is correspondingly, therefore cos. α smaller. The following factors come, therefore, into consideration:

1. Decrease of the light intensity of the oblique rays in consequence of reduction of the active opening.	Proportionally cos. α.
2. Decrease of the light intensity of the oblique rays in consequence of increase of distance.	Proportionally cos. $^2\alpha$.
3. Decrease of light intensity of the oblique rays in consequence of their falling slantingly towards the illuminated surface.	Proportionally cos. α.

The intensity $I\alpha$ of the light rays at any point of the picture is therefore $I_1 = I \cos.^4\alpha$, whereby I represents the intensity in the picture centre and α is the angle of the bunch of rays belonging to the same.

After this formula the brightness at every point of the picture, in comparison to that of the picture centre, can easily be calculated.

Schroeder, in his *Photographic Optics* (p. 133), gives the following table:



A Japanese Musician.

Engraved by
I. TANAKA, Tokyo, Japan.

α	2α	$I\alpha$	$I\beta$
10°	20°	0.9406	0.3998
20°	40°	0.7798	0.7459
30°	60°	0.5625	0.5373
40°	80°	0.3444	0.3274
50°	100°	0.1707	0.1602
60°	120°	0.0625	0.0567

In this table α designates the angle and 2α the whole picture-angle, which corresponds to the diagonal of the largest visual field. Under $I\alpha$ is found the brightness for the different picture-angles, under the supposition that the brightness in the picture-centre is equal to 1. Under $I\beta$ are mentioned the brightnesses which are obtained if at the calculation the loss of light at one single plain glass surface is considered. The absorption of the glass and the curvature of the lens-surface have not been considered here as the sizes differ with every apparatus. Indeed, the brightness is still less than mentioned in the table. Only to the camera where the light has to pass no glasses can the above formula be applied without further comment. Rob. H. Bow proposed, therefore, to use the pin-hole camera for the determination of the decrease of brightness from the centre of the picture towards the edges.[1]

The development of the formula ($I\alpha = I \cos. \alpha$) in the above manner has been communicated by Stolze.[2] Rob. H. Bow attained the same result in the same way.[3]

The formula can also be drawn from the principles set forth by Lambert, and we obtain then at the same time a general expression for the brightness of the several parts of the picture.

We will say S and s are surfaces of the illuminating and the lighted body, accepted as even. (But if the bodies are not even their projections can be put in their place at any even surface.) If α is the angle formed by the rays with the normal upon S, β the angle formed by the rays with the normal upon s, and D the distance of both bodies, then the number (Q) of the light rays, which radiated during the time upon the surface s by the surface

[1] *Brit. Journ. of Photo.*, 1866, p. 256. *Photo. Archiv*, 1895, p. 215.

[2] *Das Atelier des Photographen*, ii., 1895, p. 171. *Photo. Wochenblatt*, 1885, p. 226, and 1887, p. 302.

[3] *Brit. Journ. of Photo.*, 1866, p. 159.

S, after Lambert's rule: $Q = E \frac{S.\ s \cos. \alpha. \cos. \beta}{D^2} t.$ [1] E is thereby the number of rays radiated by the surface-unit of the illuminating body in the unit of distance upon the surface-unit during the time $\frac{one}{x}$.

Suppose the object to be taken consists of an even surface A.B. (Fig. 1), which at a distance D stands vertical to the axis of the objective; a. b. is an element of the surface and α the angle formed by the secondary axis with the principal axis of the objective. If further δ is the diameter of the diaphragm, the effective opening is nearly equal to $\frac{\pi \delta^2}{4}$ [2] and the number of light rays, falling during the time-unit upon the objective:

$Q = E \frac{\varsigma.\ \pi.\ \delta.^2 \cos.^2 \alpha}{4\ Oi^2}$ or $Oi = \frac{D}{\cos. \alpha}$, also $Q = E \frac{\varsigma.\ \pi.\ \delta.^2 \cos.^4 \alpha}{4\ D^2}$

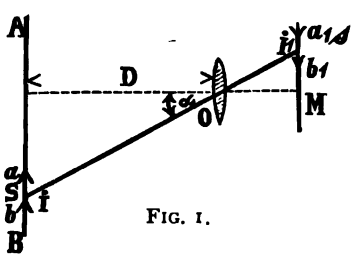


FIG. 1.

This is the number of light rays entering into the camera and distributing themselves upon the picture a_1, b_1. If we designate the surface of the picture a_1, b_1, as s, thus $s = \varsigma \frac{F^2}{(D-F)^2}$. [3] The brightness of the picture a_1, b_1, that is, the number of light rays which fall upon the surface unit, is therefore

$$H = \frac{Q}{s} = E \frac{\varphi\ \pi.\ \delta.^2 \cos.^4 \alpha.\ (D-F)^2.}{4\ D^2\ F^2}$$

This expression shows that the brightness of the picture towards the edge decreases with the fourth of the cosine of the angle. For the objectives enclosing a large angle, the unequal brightness may be very disturbing, the edge requiring a much longer exposure than the centre. At a side angle of 90°, the edges will not get one-quarter of the light of the centre; at side angles of 120°, according to Schroeder, the brightness may be,

[1] A. de la Baume Pluvinel, *Le temps de pose*, p. 5.

[2] The diameter of the diaphragm is only with the single objective equal to the effective opening of the same. With double-objectives the effective opening is $d = \frac{\varphi.\ \delta}{\varphi - l}$, whereby φ is the focal distance of the front lens, δ represents the diameter of the diaphragm, and l the distance of the centre of the diaphragm from the second central point of the front lens.

[3] $\frac{s}{\varsigma} = \frac{Oi_1^2}{Oi^2} = \frac{OM^2}{D^2}$. Now $\frac{1}{D} + \frac{1}{OM} = \frac{1}{F}$, if F is the focal distance of the lens. Result $OM = \frac{D.\ F}{D-F}$, therefore $\frac{s}{S} = \frac{F^2}{(D-F)^2}$.

under unfavorable circumstances, thirty to fifty times less at the edge than in the centre.

An attempt has been made to make the brightness of the picture uniform as much as possible, and this has been tried in different ways. Stolze gave a longer exposure to the edge than the centre and used for this a stationary or rotating diaphragm.[1] Miethe exposed parts of the picture equally long, but reduced the central bunches of rays by a compensator. The same consists of a thin plano-convex smoked glass lens, which has been fastened to just such a thin plano-convex lens of white glass. This lens, which acts like a plano-parallel plate, is dark in the middle and transparent toward the edges; it absorbs also the central bunches of rays much stronger than the oblique ones. With a suitable selection of the smoked glass and curvature of the lens, the decrease of light may be fully allowed for by the compensator.[2] There are also other methods, but all have the disadvantage that the light power is reduced and the time of exposure is prolonged. Much more favorable it would be if one succeeded in making the oblique bunches of rays much stronger and have the direct ones unchanged. To do this the incline of the oblique bunches would have to be considerably reduced, without any injury to the picture angle. This could be effected, according to Schroeder,[3] by putting the diaphragm between the lenses of a symmetrical wide angle, not as ordinarily in air, but in a liquid of high refractive index, perhaps $n = 1.7$. The angle α of the oblique bunch is then reduced in the diaphragm to $\frac{\sin \alpha}{n} = x$, but with a wide angle of 120°, $x = 30$ to 40°. The defect of the decrease of light strength was therefore reduced from 0.0567 to $\sqrt{0.0567} = 0.238$ the same as takes place with a wide angle of 90°.

The lenses, of course, must then be differently constructed, but that the execution is not impossible is proven, for the same arrangement is already in our eye.

Sometimes a stronger reduction of the light towards the edges of the picture takes place. It is produced by a partial or complete working off of the oblique bunches of rays which fall upon the objective. This appearance usually takes place when the lenses

[1] *Photo. Wochenblatt*, 1887, p. 311.
[2] Miethe, *Photo. Optics*, p. 95.
[3] Schroeder, *Photo. Optics*, p. 139.

are too small, and if they are not sufficiently close together. One can be easily convinced of this if the diaphragm is taken out, the eye placed in place of the ground glass, and then slowly moved from the centre of the field towards the edges. In the beginning the front lens is seen completely. But pretty soon the edge of the front lens will come into the visual field, the front lens becomes more uncovered, and finally disappears entirely. For each point of the picture field that part of the front lens is in operation which can be seen from there. The light power, which is proportional to this surface part, decreases therefore extremely and becomes finally equal to o. If a second diaphragm is put in, the eye can be moved considerably further towards the edge, until the previous appearance takes place again. But if an objective should "vignette," a smaller diaphragm must be used. The defect is removed at the expense of the brightness of the picture centre.

CELLOIDIN PAPERS. BRILLIANT PRINTS FROM FLAT AND THIN NEGATIVES.

BY E. VALENTA.

MY article in last year's ANNUAL was in reference to this kind of celloidin paper—a paper which was obtained by the application of chromic acid, or an emulsion containing chromates, and which I called chloro-chromo-citrate emulsion.

The production of such an emulsion is very simple, and it can even be found in the market. The celloidin paper is easily recognized by the yellow-red coating (film), which disappears at once in the fixing bath.

That the application of this paper offers certain advantages is beyond doubt, and, in the above-mentioned article, I have spoken about its properties and its application in certain special cases. At the same time I did not forget the disadvantages of the chloro-chromo-citrate paper in comparison with the ordinary celloidin paper. The principal drawback is the peculiar effect which the chromium in these emulsions exercises upon the sensitiveness of

the paper. The prints on such paper are also greatly reduced in the toning and fixing bath, and have therefore to be so strongly over-exposed that the picture is hardly visible any more. The reason of this "reduction in the combined bath" is to-day, after knowing that mixtures of fixing-soda solution and bichromates form very powerful reducers for printed-out slow pictures, completely clear, but does not change the fact of the reduction. A great advantage offered in general by the application of chloride of silver emulsion papers like aristo and celloidin papers, namely, their relatively short printing time as compared with albumen paper, has become illusive by these disadvantages.

A number of experiments made by the writer to study the influence of the different metal-chlorides and certain organic acids upon the character and durability of the chloride of silver collodion emulsions, gave results which will enable one to produce brilliantly-printing celloidin papers for flat, thin negatives, without the addition of chromates, and, therefore, also without the disadvantages of the chloro-chromo-citrate paper.

If by the production of a normal celloidin emulsion (I call by this name an emulsion which at a gradation of 14 to 15 degrees furnishes handsome, strong, and good toning prints with well-covered negatives) the ordinarily-applied chloride of strontium or lithium is replaced partly or entirely by equivalent quantities of chloride of copper, more or less greenish-colored, faintly transparent emulsions are obtained, which have to be left standing from 6 to 24 hours before they can be used, and by which celloidin-papers are then produced which, according to the quantity of copper salts they contain, will furnish prints more or less rich in contrast.

Emulsions, where chloride of copper and no other chlorides were applied, will give celloidin papers whose gradation, according to the excess of silver salts, will amount to 6 to 8 degrees, against 14 to 16 degrees of the normal emulsion.

The sensitiveness of these papers is of course somewhat less than that of the ordinary celloidin paper, but surpasses that of the albumen paper considerably; and, besides this, these papers if properly tested do not have the great disadvantage of the chromo-citrate paper of suffering reduction in the combined bath, but remain—if the normally printed pictures are well washed in soft water before toning, with regard to "reduction"—quite nor-

mal. But if the prints are put directly into the combined bath without any previous washing, the picture will disappear almost entirely—a peculiarity which I had repeated opportunity to observe by applications of pure chloride of copper emulsions.

The same advantages which are offered by the chloride of copper emulsion paper, without the last-mentioned peculiarity of this paper, are also offered, as I have found, by chloride of silver collodion papers, which were produced by means of certain chloride compounds of uranium.

If in place of strontium or lithium chloride as used generally for the production of collodion paper emulsions, suitable quantities of uranyl chloride are applied, faintly yellow-green colored emulsions are obtained, which furnish papers with a very moderate extent of gradation. These collodion papers hardly differ externally from the ordinary celloidin paper; they possess a little less sensitiveness, print very uniformly, and tone very rapidly in sulphocyanide or other gold-toning baths, as also in combined baths. The gradation of these papers is 5 to 6 degrees, and by application of uranyl chloride alongside of strontium or lithium chloride, emulsions can easily be produced, which show 8, 9, 10, and 12 degrees, and are therefore suitable for flat and thin negatives. The prints upon uranyl-chloride emulsion papers suffer very little reduction, show only a very moderate tendency to bronze, and give brilliant pictures if the proportion of the uranyl chloride to the silver salt and to the citric acid or tartaric acid is correct—even with ordinary thin negatives at a relatively short time of exposure. This behavior has led me to the opinion that these papers will become popular. It is probable that the above-mentioned salts of copper chloride and uranyl chloride will act similarly in chloride of silver gelatine emulsions. Experiments on the best manner of production of chloride of silver collodion emulsions, containing copper and uranium salts, for the purpose of printing from very flat, foggy, or thin negatives, are being made at present in the Imperial Academy for Photography and Reproduction, in Vienna, and the results of the same will be published at the proper time.

ORTHOCHROMATICS.

By Dr. Victor Schumann.

THE orthochromatic plates found in the market are mostly prepared with erythrosin or erythrosin silver, which gives them a yellow sensitiveness not reached yet by any other color matter. Unfortunately they are not at the same time sensitive to red rays, which, in views of colored objects, play a hardly less important part than the yellow ones. Where the red predominates, cyanin or another red sensitizer has to take the place of the erythrosin. Plates of this kind are not kept in stock on account of the lack of permanency. The consumer is therefore obliged to sensitize these plates himself, and, as he uses generally only manufactured plates, to have recourse to the bathing process. The coloring of the plate in the bath is such a simple operation that plates of this kind should always give the same results. But that this is not so, is proven by the many complaints of those using cyanin and similar sensitizers. What is now the cause of these varying results? For a number of years I have made a pretty close study of cyanin and other color matters, and my aim was to discover the source of the defects which render the proper application of these plates so difficult. According to my observations, there is one particular circumstance to be considered which I found disregarded wherever cyanin plates were applied. Those who require a red sensitive plate take generally any popular plate they can find in the market. This is wrong. Cyanin demands a very careful selection, to prevent failures of different kinds during development and afterwards. The idea is erroneous that a plate which, uncolored, makes a fine picture, should also give the same results after sensitizing. On this point photographers err considerably, not only with cyanin but with other color matters having a tendency to fog. The first attention should be paid to the selection of a suitable plate, and gelatino-bromide of silver of moderate sensitiveness can be recommended. It should contain no iodide of silver, or at least only a very small quantity, and also no other mixtures.

Iodide of silver obstructs always the action of the sensitizer,

and the same can be said, as a rule, of other mixtures. The surest way is to prepare the emulsion personally, being careful to wash the gelatine repeatedly in distilled water before cooking. In this way all soluble matter which is of injurious influence to the color matter is removed. Of all methods I prefer the one by cooking. It furnishes the most suitable sensitiveness, and that is very important. The emulsion must also be poured onto the plate soon after its preparation, because its sensitiveness, and therefore also its tendency to fog, increases. Plates of this kind will give faultlessly pure, and, in the shadows, glass-clear, negatives.

For particulars about cyanin plates I refer to my article in the *Photographische Wochenblatt*, Nos. 6, 7, 9, 10, 11, 12, 1896: "My Cyanin Experiments with Gelatine Emulsion."

The continuation of these observations showed further that the sensitizer, according to the condition of its bath, according to the application of certain additions to this bath, and, further, according to whether it is mixed with the emulsion before flowing or embodied in the dry plate, also changes the color sensitiveness completely. It proved that with cyanin the sensitiveness of the plate to yellow, red, or blue, or for all colors together, can be increased at will. My experiments with erythrosin and erythrosin silver led to similar conclusions.

This proves the important fact for orthochromatic photography, that the idea that the formulas generally in use for the coloring of the plates insured with all color matter the highest possible color-sensitiveness is by no means correct. On the contrary, by reason of my observations many color matters require a special treatment, deviating more or less from the ordinary sensitizing process if their full orthrochromatic action is desired. As an instance of this I may mention the Alizarin blue S., recently put on the market. This color matter sensitizes, as proven by the labors of George Higgs and others, considerably for the extreme red and the adjoining infra-red to the wave length 8223 A E. Applied in the old manner it gives a remarkable, but by no means the highest, red sensitiveness.

As far as I have come in my researches I can say that, in consequence of a property of the Alizarin blue hitherto unobserved, this red sensitiveness can be increased from five to ten times. Reserving further communications, I will only mention here that

Hare Sr. and Jr., in "A Pair of Spectacles."

Flashlight by J. BYRON.
Engraved by
WM. C. GAGE & SONS,
Battle Creek, Mich.

this property increases the orthochromatic value of the plate by increasing its red-sensitiveness, but leaving the blue-sensitiveness unchanged. As the Alizarin blue improves the clearness and intensity of the picture at the same time, it deserves our particular consideration, especially where a sharp definition is required, as for instance in spectrum-photography.

INACCURATE TRIMMING OF PRINTS.

BY J. H. HARVEY.

SCARCELY any ordinary collection of photographs obtained from many sources can be inspected without instances of one or both of the following defects being noted.

In the first place, how frequently we notice that the line of the horizon is not parallel with the top and bottom edges of the print? This is very often the case in yachting and marine views and also in work done with the hand-camera.

Only a few days since I saw a lovely photograph of a yacht in full sail which illustrated this defect; this was made by one of the leading yacht photographers in the world, and in it the line of the horizon was fully half an inch out of level in a length of about twelve inches! The major portion of the print was monopolised by the sails and sky, and the very small portion occupied by the water brought the slanting horizon out so prominently that the effect was quite irritating, giving the eye the impression that the water was suddenly rushing downwards to fill some void created by an opening of the earth and that it was carrying the boat with it.

Those who produce the prints apparently wish to trim them in such a manner as to give the largest area of paper possible (prints being sold at prices which vary according to their dimensions), and thus sacrifice the correctness of the line formed by the intersection of the sky and water.

The same defect is sometimes noticed in photographs of architecture, but is not so frequent in this case, as the principal object itself contains such a large number of vertical lines that if

the top and bottom of the print are not parallel and horizontal the inaccuracy is noticed at once; but for all this it is not uncommon, and to a critical eye it advertises the carelessness of the worker in a very pronounced manner.

In general views, it is often more difficult to determine whether the print has been properly trimmed or not, but the producer of the print should have no difficulty in performing the operation correctly if he has taken the precaution to level his camera before exposing the plate, for, if this detail has been attended to, the print will simply have to be cut so that its finished edges will be parallel to the edges of the negative.

The same fault is very often to be found with lantern slides, and these sometimes appear ludicrous.

It has been mentioned that photographs of buildings contain a number of vertical lines; they should do so when the necessary adjustments have been made in the camera, but the production of photographs of architectural subjects in which the lines are not rendered correctly is an every-day occurrence, and is considered of so little moment by many, that photographs erring in this respect are frequently submitted for competition, and reproductions of prints possessing the same defect are not uncommon in architectural magazines!

People do exist who exhibit such carelessness in these matters that they are said to possess a "crooked eye"; and we continually come in contact with some who can perceive no incongruity in the trimming of a print or in the shaping of anything else in the manner drawn attention to; when the fault is pointed out to them they are perfectly conscious of it, and even then will sometimes be heard to remark that "it is a small matter and not worth making much fuss about."

It is no doubt only one of the many *small matters* the sum of which builds up every great work, and, small and simple as it appears, the fact that it is so common is sufficient justification for again drawing attention to it.

NEGATIVES FROM NEGATIVES—CONTRETYPES.

By Charles Gravier.

ONE of the greatest pre-occupations of the photographer, be he professional or amateur, is the preservation of his negatives—often the result of artistic wealth or heavy expense. Certain negatives have become, either by the destruction of the original or by the disappearance of the subject, plates of precious value, property representing heavy sums. (A negative of the entry to the old port of Havre, demolished some twenty years ago, was bought for 200 francs.)

When one sees that these useful negatives repose oftenest on so fragile a support as glass, it does not assure one of the durability of these photographs.

But the perplexity becomes greater when a friend, or a colleague, or an editor, seeks to borrow that which we touch only with respect. The fear to displease, or the desire to gain by it, compels one to give it up.

Fortunately Providence, under the guise of human ingenuity, gives us the means to rest easy in keeping our own, even when giving satisfaction to our friends or to our interests.

Photographers have at present a rapid method, sure and certain, with the aid of which they can reproduce their negatives. To this class of reproductions the name of contretypes has been given. They can be reproduced either with the camera, or by contact or superposition in positive printing frames.

We will outline the method just as it gives us satisfaction. We have tried methods given by several authorities, among which are principally Carey Lea (1865), Biny (1881), Balagny (1889 and 1893), Cornu (1893), Rossignol (1893), and Maillard (1896). They have all employed the same general method. A sensitized plate is placed in the negative plate-holder of a camera, or in a positive printing frame in the same way as for a positive. One develops in quite an energetic developer, and obtains the usual transparency. The image is destroyed with an oxidiser and nitric acid which dissolves it. Then develop again, but in white light, and the reproduction of the original negative is obtained, which may have different dimensions, if the camera has been utilized,

and which can be more or less intense than the negative in accordance with the way of developing.

It is seen that in this method there are valuable resources, one being able to obtain an improved negative. The manipulation is as follows (plates with very thin gelatino-bromide coating being taken):

1st. After exposure they are developed in the following bath

Water	100 cc.
Sulphite of Soda	5 gr.
Hydroquinone	2 gr.
Caustic Soda	2 gr.

Develop until the image is visible on the back of the plate.

2d. Arrest the developing by placing the negative in the following bath:

Water	100 cc.
Boric Acid	2 gr.

Leave it in this bath for two minutes, then rinse it twice (After this washing one can operate with white light.)

3d. Place the negative in the following transforming bath:

Water	100 cc.
Bichromate of Potash	1 gram.
Nitric Acid	2 grams.

The black image becomes a reddish yellow; wash carefully, then wash in a solution of caustic soda of one-half grain in 100 cc. of water until the image has disappeared.

4th. Develop in the first bath until the intensity is judged sufficient. Wash again.

5th. The plate is plunged in the following bath:

Water	100 cc.
Hypo	15 cc.
Sulphite of Soda	5 cc.

Wash as usual. A clear and very transparent contretype should be obtained.

A DODGE ILLUSTRATED.

By H. M. Beeles.

EVERY photographer knows how slight a mishap may ruin a negative. It may be a resitting cannot be obtained, and that the value of the negative is, therefore, past estimation. Let No. 1 represent a picture from such a negative. As will be seen, the subject moved slightly, making bad catch lights in the eyes and destroying the line of the iris in one of them, beside making double lines along the side of the face. Added to these faults, something—no one knows what—lodged on the negative while it was still wet, and when it became dry the film underneath parted and came off the glass, leaving the same clean.

The place was first overlaid with a little yellow ochre (moist color) on the back side, just covering a slight margin more than the break in the film, and a contact transparency was then made

No. 1.

No. 2.

from which the print No. 2 was obtained—that is, after filling with a retouching pencil somewhat; then a contact negative was

obtained (see print No. 3, gotten after this negative had been retouched). You will observe that the faults in the eyes had also been corrected, and lines of movement mostly removed in transparency.

If you examine closely you will see there is a tendency to overdo the work of correction. This happens because both lead and colors are more opaque to the light than bromide of silver.

No. 3.

From the second negative (print No. 3) a second transparency (see print No. 4) was made and another attempt at correction followed, and from this the final negative was made and prints finished from it (see No. 5).

It is not probable that the case will often happen where it will be necessary to make more than the first transparency. In making this, perfect contact must be secured by placing the negative in a printing frame film up, all dust having been carefully removed from the surface and the back of the glass being perfectly clean. Then a carefully dusted dry plate of the same size is put film down on the negative and locked in, and if the springs of the frame are not stout enough to secure perfect contact there, by holding the frame firmly in both hands and press-

ing on the back with both thumbs, you can secure the desired result. The same formula answers for producing the second negative, etc.

No. 4.

No. 5.

This process will be found useful in copying old pictures that are badly scratched or are dirty, or where the eyes are poor, or a part needs strengthening or a shadow can be laid in, and in such cases you can frequently save in time more than the value of the plates used, beside producing a more satisfactory piece of work.

While there is nothing new in this, still I feel sure that it may be a help to some brother "photo." who may find himself in a like dilemma.

Exposure was made to single-burner hand-lamp (kerosene) turned half up: time, one second. Develop transparency as strong as a negative and you are all right.

THE COMBINED TONING AND FIXING BATH.

BY COMMANDANT V. LEGROS.

OUR purpose in writing these lines is not to recommend the use of combined baths in preference to separate baths, as we agree entirely with the charges that are daily made against these baths. We wish simply to state that the majority of scientific arguments usually adduced in support of these charges are only a pitiful humbug, and we will limit ourselves to expressing the opinion that the comparative direct method, the only valuable one in similar cases, makes these baths less black than they are painted.

To condemn the combined baths, the most fantastic chemical equations have been pressed into service. But in the proper photographic operations the chemical equations are themselves but a mere bugbear. In the preparation of the emulsions, when one has placed so much of compound A in a dish, and so much of B, providing that no gas has been set free, one has the certainty that each atom of the elements constituting the compound will be found in the result. Even if a gas has been set free, there are means to gather it and to force its action. This is what the chemical equations express, based on the vigorous rendering of these elements at the beginning and ending of the manipulations. But in photographic operations, properly called, where a few milligrammes of active substance badly defined have been treated by tons of liquids of various kinds, and the final condition of these substances in the resultant image remains to the present a mystery, chemical equations are but a play of alphabetical permutations, good for the idle who pass their leisure in unravelling wastes.

The greatest fault charged against combined baths consists in the so-called sulphuration of prints, this sulphuration, however, being systematically attributed by some to sulphocyanide of ammonium and by others to hyposulphite of soda. Nevertheless, it can be said that sulphocyanide of ammonium is not essentially more an ingredient of the combined baths than of the separate. Then again, placing sulphuration, if sulphuration there be, specially against sulphocyanide is a risky hypothesis, when

Cleo de Merode.

Photograph by OGERAU, Paris.
Reproduction by
THE PHOTOCHROME ENG. CO.,
162 Leonard St., New York.

one considers the proportions in which hypo and sulphocyanide are used definitely in each proof; also the relative ease with which each of these salts is brought to give up its sulphur on the least provocation, and particularly by the action of alum.

Leaving this point under a wise reserve, we will call attention to the precipitates formed in a few days at the bottom of the greater number of combined baths, and which are got rid of before using. It is very evident that, in the separate operations, at least between each washing which is not found at all in current traditions, the substances producing the precipitate would be found in the substance itself of the proof; this certainly could not be looked upon as a favorable condition to the permanency of the proof and to the purity of the high lights.

Lastly, has sulphuration itself consequences as disastrous as those imputed to it? One of the first forms of toning consisted neither more nor less than toning with sulphuric acid. Is there anyone at present who can think that there is any reason why this toning should give way to any other so long as permanency is only considered, as silver sulphide is to all account the most stable of all the combinations of this metal.

One often forgets that all theory of the deterioration of proofs of argentic salts must explain at the same time the yellowing of the high lights and the vanishing of the most intense shadows; these constitute two almost contradictory phenomena. In a very interesting study published in the *British Journal Almanac*, 1896, Messrs. Haddon and Grundy show that the most perfect processes at present known of fixing and washing proofs still leave in the whites a quantity of argentic salts sufficient to produce an appreciable image, if one takes the pains to bring these salts to the most favorable form for printing, and they add in conclusion: "With such evidence is it astonishing that silver prints, after a very short time, turn yellow and then fade?" The "yellowing" seems to be thoroughly explained, but the last phrase, "and then fade," seems to have slipped in for the purpose of ending the term, without one being able to find in the rest of the article a single word foreshadowing its coming, or justifying it.

The author of a memorial presented to the "Congress des Sociétés Savantes de France," in 1895, endeavors to establish a relation between the sulphuration of proofs and their disappearance, imagining, under the influence of atmospheric agents, a

transformation of argentic sulphide into sulphate, which is white. This transformation or change is assuredly suitable, as it brings in the action of ozone. But is it true that these influences preponderate universally enough to explain the multitude of cases in which the images disappear, and practice must record? The best known facts are not favorable to this supposition. The natural sulphide of silver (Argyrose), the fracture of which is of a grey black, becomes, by exposure to air and light, a most beautiful mat black which the inventors of platinum paper have, up to the present, searched for in vain. The dyes for coloring the hair black have nitrate of silver as a basis, which changes into sulphide, and this in the most favorable conditions for the production of sulphate (production of sulphur in presence of nitrous products set free). Again, an argument perhaps more topical, wishing to avoid all blame for this allegation, we have been able to see that the majority of colorless compounds of silver, sulphate of silver, well mixed with organic substances such as albumen or gelatine, darken under light. When a proof has disappeared under the action of the processes used, it would suffice to expose it to the sun to regenerate it.

The presence of a lead salt in certain formulas of combined baths has also been made the subject of abuse. The only rational means of recognizing the value of these imputations is to submit them to experience. This is what we have attempted to do with the assistance of the method of largely washing, which we have described in a preceding volume of the ANNUAL. We have prepared with lead salt the quantity of combined bath necessary for toning twenty-four proofs, and in only one half of this bath we added some salt of lead. In each half we first toned twelve proofs; then, after allowing it to rest for several days, we added to each bath a new dose of gold, and again toned twelve new proofs. On thoroughly washing, the two dozen of the first series went through in an irreproachable manner in every way. In the second series the bath with salt of lead gave six irreproachable proofs, the bath without lead did not give even one. We concluded therefore that the bath with lead had the advantage.

The real danger of the combined baths is, if we do not err, in the attempts of those using it to make it serve too long. The combined bath should be discarded exactly at the same point as the hypo bath. The operators cannot bring themselves to do

this, as it costs twenty or thirty times more. The criticisms addressed them by those who proscribe its use tend above all to have them consider all proofs as faded which are so produced, without taking into account all those which are similarly produced with the separate baths.

An advantage almost universally recognized in the combined baths is the facility with which they assure, in the use of new papers, the uniformity of tones over the whole extent of a single proof. The simplicity with which they are manipulated is not to be discussed. These are sufficient advantages, in our belief, to keep us from turning the debutant, at least, from trying them.

WHY SHOULD I KNOW?

By Fred. W. Pilditch.

IT has often happened with me, and doubtless also with many of my brother workers, that there are certain eras of the photographic year when, for sheer lack of possibility, we sit as it were with our arms folded and indulge in speculation as to what will be the next phase of things probable and possible to us and our craft. The "new photography" boom, and the "science of advertisement," are—like the poor—always with us, and it takes a stern resolution on our part to rouse us from the imaginative fancies into which we have drifted and to actually force upon us the necessity that we should seek to be up and doing, and working again at a tangible and coherent study.

Now in the columns of the ANNUAL of 1895 I urged the plea that "*A little knowledge was a useful thing*," and maintained that a study of chemistry would be of immense use to the pursuer of photography in general; I urged beginners to take up such a course, and I now maintain that those who took my advice will acknowledge the use they find it to them in one or other of the many branches of our art.

But I hear some say, "For what do I need to know the technical intricacies of scientific mysteries? Is it not sufficient that I am acquainted with the canons of art and know all the rules of pic-

to admit that there might be more things in heaven and earth than were dreamed of in *their* philosophy.

As regards art and science the matter stands just thus: Science is *knowledge*. The only difference between common knowledge and science is that the latter is more organized, systematized, and complete than the former. What "versus" can there be between art and completed knowledge? None; or, if there is, it is damnatory to art.

The writer of the article referred to makes the very vulgar mistake of supposing that absence of science (ignorance) is necessary to enable man to appreciate the poetry of nature: "The rhythmical, lulling playing of the water across the stones . . . a song without words of the spirit of the glen." Nothing could be more entirely wrong. To take an instance or two: The amount of science displayed in the writings of Shakespeare is quite wonderful, and far ahead of his time. Another, there could be no more charming dreamer than John Ruskin, yet there have been few men more truly scientific. Goethe, however, is the most notable example of all, and it is to be remembered that he was, to the end of his days, fully as proud of his scientific work—now proved to have been really great, though at the time laughed at—as of his art, his poetry, and his wonderful prose writing.

But this is not photographic, and it was not to write about this that I started. It was about the supercilious, when not actually contemptuous, attitude assumed by the "superior persons" of the new school of photography with regard to scientific work and the workers that I wished to say a few words. Nay, even purely technical knowledge (a small branch of science) they would now have us despise. At first their attitude was something like this: "A photographer can make pictures without being scientific, and with only a very little technical knowledge." Now it has almost come to be, "a photographer cannot make pictures if he be scientific, and the less technical knowledge he has the better."

At first it used to be "a photograph may be a picture without being technically perfect." Now it would almost seem to be "the more technical imperfections there are in a photograph, the more likely is it to be a picture."

Of course I am burlesquing a little, but not so very much and all this kind of stuff is affectation of the very worst kind.

It is quite true that the chief work of the artist by photography is to make pictures, and that scientific research is out of his way. Though some painter artists have not scorned to scientifically investigate the matter of the colors they used, or even to invent new ones, they may be sure that their work will be made none the worse but probably the better by technical and scientific knowledge,[1] and that the more of it they have the better their pictures are likely to be.

It is a complete mistake to suppose that real painter artists despise technical knowledge in connection with their art. I have been with eminent painters whilst they have discussed for hours about varnishes, pigments, the possibility of discovering or inventing new ones to get this or that effect—a "whiter white," etc.—and they have applied to me eagerly on account of my knowledge, or supposed knowledge, of gums, resins, and lacquers, to help them to get special effects.

The greatest artists have, I believe, always paid particular attention to the technical matters of their "trade."

As to what an artist by photography should know: He certainly does not need to have any profound knowledge of chemistry—though it will do him no harm, as some of the modern "superior persons" would seem to imply—but he should know the photo-chemical properties of the constituents of his developer, fixing bath, printing paper, etc.

He does not need to have a deep knowledge of optics, but he should thoroughly know the working properties of the lens or lenses he uses, and if he uses more than one, what may be the distinguishing properties of each.

And so on.

Then as regards technical perfection of the photograph, it is very far from being the first thing if the photograph is intended for a picture, and is decidedly of secondary consequence; but it is quite certain that a picture, howsoever made, is better, not worse, from being technically perfect.

And, finally, let the individual who provoked this communication and who would "fly from the material world," stay where he is. This world is quite good enough for him. As to the "superior person," let him give others than himself a chance to get in a word edgeways concerning his superiority!

[1] By scientific knowledge I mean knowledge qualified as described above.

LANTERN SLIDES.

By C. H. Bothamley.

FEW photographic operations have more fascination than the production of lantern slides. Certainly in most cases no other form of positive print will so well exhibit the beauties of the picture. For the highest degree of success, however, attention is necessary to several points, and to some of these it may be useful to direct the attention of beginners in this branch of photographic art.

There is a widespread opinion that slides made in the camera are, as a rule, of finer quality than those made by contact-printing. This opinion is certainly not without some foundation, and my own practice is to make slides in a camera, even from quarter-plate negatives. The apparatus needed is only a quarter-plate or 3¼ x 3¼ camera, a deal board to serve as a base-board and support, and at the end a support for the negative. Illumination of the latter is obtained by simply pointing the apparatus towards the clear sky, and extraneous light is prevented from entering the lens by placing a black cloth over the space between the negative and the camera.

Any shortcoming of contact slides that arises purely from the fact that they have been made by contact is probably to be attributed to a "creeping" or scattering of the divergent rays of light from the flame used to make the exposure, and this cause will be more active the nearer the printing frame is held to the flame. If the old practice were adopted of placing the printing frame at the bottom of a box about two feet long, so that the negative is illuminated by what is practically parallel light, it is probable that there would be no appreciable difference in quality between contact-made slides and camera-made slides, other conditions being equal.

A very large proportion of the slides that are exhibited are very far from being pleasing, not to say artistic, because of their "soot and whitewash" character. That is to say, the contrasts are much too strong, the shadows are far too dark, and there is an absence of detail in the high lights. The result is a spotty effect, fatal to that breadth which is an essential feature of a real

Falls of Minnehaha.

Engraved by
BRAMBLETT & BEYGEH,
Minneapolis, Minn.

picture. The best way of avoiding this evil is to take care that the negatives from which the slides are made are fully exposed and not too dense, and that the lantern-slide plate is also sufficiently exposed. In order to get a perfect slide, the exposure should be such that detail in the highest lights is obtained before the shadows have clogged up and lost their transparency.

On the other hand, if the slide is to be clear, and not muddy, it is equally important not to give an excessive exposure, and it is of still greater importance to develop in such a way as to avoid the production of general fog, especially if the effect of sunshine is wanted. Care has also to be taken in judging the opacity and stopping development at the right time. Slides to be used with an oil lamp may be distinctly thinner than those to be used with the lime light, and these in their turn thinner than those to be used with an electric light.

As to the character of plate to be used, there is a wide choice, but probably there is nothing better than a gelatino-bromide emulsion, made with a somewhat soft gelatine and containing only silver bromide in an extremely fine state of division. Developers again offer a wide choice. Ferrous oxalate has always been a favorite for lantern-slide making, and, with plates such as those described, it will give beautiful images of a fine warm brown color. Difficulties and troubles arise, however, unless a good supply of soft water is available. Where the water supply is hard, hydroquinone or pyro is to be recommended, and those who like a slide with a warm color will find a weak pyro developer to give excellent results with many commercial brands of lantern plates.

PROCESS WORK.

A GYPSY GIRL.

PHUSOCHROME FROM
COLORED PHOTOGRAPH.
[O]RIGINAL NEGATIVE AND PRINT.
BY E. TANENBAUM.

TO A BEGINNER IN ETCHING.

By C. B. Talbot.

TO tell a man just how to do a thing by writing about an enamel process would seem to be almost a folly, but it has occurred to me that a few words about the first rolling of ink on an albumenized plate, before its first etching, might be seasonable, as many try and fail, when they should succeed, at this point.

The albumen coating for a plate is made by beating to a froth the white of one egg, adding then seven ounces of water, and when well shaken and mixed, placing therein from twenty-four to thirty grains of well-powdered ammonium bichromate. For the first of the two coats on the metal I have found that the swilling and pouring off the plate, as usually recommended, is wasteful, and not always successful. It often happens that a small grain or particle of dust will adhere to the plate, when it is recommended that it all be washed off, and the operation be repeated. The fluid is always filtered through some not too fine, wetted cotton cloth, yet there will always be found some small lumps of matter not caught by the filter, or falling dust from the air, to interfere with success. For if the plate is not evenly and perfectly coated, success at a later time will be impossible. To save material and the several doings over as may be required, I proceed as follows:

Having placed the sensitizing fluid in a common collodion pouring-vial, pour from it a pool on the middle of the metal plate to be coated, enough to about one-third cover it. Keep it evenly balanced and allow none to run off. Now take a straight, smooth splinter of wood, long enough to reach the pool in the centre, one end being between the thumb and finger; lay the splinter near the middle on the edge of the plate, and gradually lower the free end until it will touch the fluid pool in the middle. Now draw the splinter toward the plate edge, and bring with it some of the fluid, which will easily follow it, but take care not to allow the end to touch the plate, as it sometimes leaves a mark which will appear when inking is finished. Singular as it may appear, after the plate has been wetted all over, the end can be used

to remove any little particle which appears, without making a mark. The splinter resting on the edge of the plate is laid on the pool and pushed along from the centre to each corner, and same on each of the four edges. The plate has now been coated all over by using only a little more than would cover, and only a few drops will be poured off instead of an ounce or more as commonly recommended. As before stated, some little lumps on the surface are nearly sure to appear. Take the end of the splinter and gently shove them to the edge of the plate, which is to lie downwards while draining. When this has been done (it is not necessary to remove the very smallest ones, as they seldom do any harm), stand the plate on edge so that one of the corners is lowest, and allow it to drain and dry, requiring but a short time in dry weather, but longer in damp. During this time no artificial heat should be used if the plate will dry without it. In general, the bichromated skins of any sort should be little heated, as they are injured by it, and are very sensitive to heat in even a slight degree. If it becomes necessary to hurry the drying, keep the plate a good distance from the heater—far enough so that the hand can but just feel it and no more.

The second coat is put on as usually recommended, or coated in the same manner as described above, only that a "whirler" of some sort is used to remove and equalize the fluid covering. It is now dried spontaneously or artificially as before, and is ready for printing in the screw-backed pressure frame. See that all the screws are evenly brought down on the back board, and examine the front glass to see that no particle of lint or dust has lodged before the negative and plate. In bright sunlight, in our climate, it usually requires from two and a half to three and a half minutes to print; in partially open and cloudy, ten to fourteen minutes; in totally cloudy weather, from twelve to twenty minutes. As a general rule, I find about four times as much time is required in cloudy or dull weather as in bright sunlight. If electric light is used, the time can be more accurately determined, and once known, followed closely.

Now for "rolling up," as it is called. Take any good lithographic transfer ink, procure a small earthen jar or glass bottle having a depth of two or three inches, and a stopper hole, say, of two inches, so that a good cork can stop it. Take a knife, clip up the ink into small thin slices, and wet with as much turpen-

tine as will make it have a consistency of type-printing ink. It should be worked as thick as possible—the thicker the better. Just here the point has been reached where the beginner oftenest has difficulty. When the ink has been softened in the jar just mentioned, it is easily rubbed up with a palette knife to a consistency fit for use, and in sufficient quantity. When done with a few drops of turpentine as usually described in the books, there is rarely enough of the ink in a condition to use, and it requires much time and care to bring that little into a usable condition, but with a bottle of the softened article on hand, it is more readily reduced and rubbed up. Take of this, say, as much as would make a lump the size of two or three large beans. If soft enough, mix with the palette knife until it is evenly kneaded into a stiff paste —not fluid. If the leather roller (four or five inches diameter, and seven or eight inches long) has been used, it should be wiped off clean of any dust; a few drops of turpentine are then sprinkled on the ink slab (of stone, glass, or metal); it is wiped *clean of any old ink* that may be on it. Now take some of the freshly prepared ink and place it in little dabs on the slab. Take care that there is but little of it, as trouble comes from having too much,—more can be put on if needed,—but if too much, nothing can be done, and failure will surely occur. Take the roller in both hands and roll the ink vigorously so that the slab, if of white marble, will only look browned well when the rolling has been finished—that is, the stone will still appear as if not entirely black, as it would if fully inked. If a glass plate is used, place a white paper under it and it will appear much the same; many use metal, but I like glass better. When the slab and roller have been evenly charged as described, commence rolling the printed plate taken from the negative; roll it in several directions until it looks evenly brown all over, for the ink usually looks brown rather than black—that is, the metal can still be seen shining through the coat of ink. If the plate has been inked so as to appear black, it is almost certain to have been over-inked, and will not develop, even if the negative printing was previously perfect. Care at this point will enable the young operator to succeed, when he might fail dozens of times if not observed. Indeed, his chances of success are better with under-inking than over-inking his plate. An under-inked plate gains in thickness as the developing progresses, as we will soon see.

Take now the freshly-inked plate and place it in a tray of clean cool water. I think it important to be cool, as it seems that development is usually better in cool rather than warm weather. Get now a tuft of soft cotton, and, after the plate has soaked eight or ten minutes, commence rubbing it with the wetted cotton, taking care not to press too hard, but use a firm, easy motion. If everything has gone well, little effort will be required to remove the surplus ink from the open places (the unprinted part) in the engraving, when the lines will be added to in strength as the rubbing proceeds, and will usually appear, when finished, as black as if they had been heavily inked in the beginning. When the lines are clear of all surplus ink, the rubbing is discontinued, the plate gently dried, and now, covered in the dusting-box with powdered dragons' blood, is ready for the first etching, when the dust has been dusted off the plate, and that which adheres to the plate is washed off by water, or putting it immediately in the first or dilute etching bath, when it is rocked gently at first, until the plate is clean, and only for a few moments; then the plate is removed and the dragons' blood melted into the ink over a gas or oil stove, being careful not to over heat but just melt the dust, which will be seen to sink or disappear in the ink. This operation of dusting and melting is repeated two or three times, when usually enough resin has settled in the ink to fully protect the metal from attack by the weak acid bath used in the first three or four bitings. The less the etching is hurried, the better the results; but usually, in this world of hurry, speed is of more consequence than clear, unbroken, clean lines, obtained best through slow etching.

The remainder of the etching process may be carried on as usually recommended, and I have only made these remarks as they seem to me required. It has been usual to pass by this portion of the process with only a few words. If I have made it plainer to some, my purpose will have been accomplished. I will not dwell on the remainder of the etching process, and the several bitings, the reinforcement by rolling the plate with ink, redusting, etc., as they are usually well enough explained to make failure rare.

From "In Vanity Fair" Drawings by A. B. Wenzell.

Reproduction by
THE PHOTOCHROME ENG. CO.,
162 Leonard St., New York.

REVERSING AND ENLARGING NEGATIVES.

By Henry Pickering.

IN response to the Editor's courteous request that I would keep up my association with the ANNUAL, I very cordially present to the readers the result of experiments in the process titled above.

How many times we wish, at one time to reverse the negative, at another to enlarge it—in the former case for collotype or zinc process work, and in the latter to enable one to print direct a number of enlarged prints. It was just this predicament that led me to conduct the experiments which have resulted in such certainty (with care, *absolute* certainty), that I feel quite justified in presenting the details to the readers of this time-honored annual.

The only condition—and that is not an absolute one—to produce a good enlarged negative, is to develop a little further in the first instance, as the amplification naturally thins the deposit. If it is only intended or required to strip the film to reverse it, the above condition does not obtain. Having perfectly dried the negative—that is, when the stripping process follows immediately on development—place a rule on the film about one-eighth of an inch from the edge inside, and draw a straight cut with a penknife, and so on all around the four sides—reason hereafter; now prepare the stripping fluid exactly in the order given as follows:

STRIPPING FLUID.

Powdered Alum	2 ounces
Hot Water	2 "

Shake until dissolved, and, when cold, filter; to the filtered and cold solution add

Pure Hydrochloric Acid 1 oz., and shake until perfect admixture. This forms the stripping fluid, and can be used over and over again, being returned to the bottle when done with. Place the negative, with the scored edges *dry*, face up, in the fluid contained in a dish larger than the size of negative,—for instance, a ¼ plate or 4 x 5 negative in a half-plate dish and allow to soak for ten minutes. Then with a camel's-hair brush or mop, begin to brush the front edge of the film, when the part along the edge divided

from the body of the film, will come away in a strip *and must be carefully removed or it will get under the film in the subsequent process.* Now you have a perfectly defined area of film, with one-eighth inch of bare glass all around; proceed as before, go firmly to work with the brush, and, beginning at the edge furthest from you, mop it up towards you, beginning at one corner and going on along the film, when you will find it will come away in one solid piece without a break. Now pour the solution back into the bottle, leaving the film in the dish, and wash with several changes of water; the film will be seen to enlarge in all directions assisted by careful strokes with the mop into a spread-out position in the water. Now carefully insert under the film the larger size glass plate previously well polished, and deftly arrange the film on its reverse side in the centre; then, placing the finger and thumb of each hand on the top corners of film and plate, gently raise them out of the water, and, after draining a short time, *blow* the wrinkles out and put away to dry, and the result will be a negative of double the original size, and no perceptible diminution in sharpness and no lateral distortion.

If the resulting film be desired the original size, after washing in two or three changes of water, pick up the film in a mass—you can't hurt it—and throw it into a bath of methylated spirit; it will then gradually shrink to its former size in consequence of the spirit absorbing the water; then float and dry on a plate as before described.

This process is very useful, and offers a great field for experiment.

THE "BUSINESS END" OF PHOTO-ENGRAVING.

BY OSCAR E. BINNER.

THE business end in most photo-engraving establishments, as far as I can learn, for the past few years has made a very poor showing, and still there is no reason why this should be so, any more than in any other business. I am a firm believer in the line of business that I am conducting, and I see no reason why money should not be made in the photo-engraving business, the same as in any other business,

provided the same is properly conducted. Let me show you what a peculiar position confronts us.

The American photo-engraver for the past few years has made wonderful strides in photo-engraving, especially in half-tone. In fact there is no part of the world where the photo-engraver has made such wonderful improvement as in America. There is not another class anywhere that has shown such progress as the American photo-engraver. In proof of this, pick up any of our leading magazines of five years ago and compare the half-tones in the same with the half-tones published in the magazines to-day. Even one not versed in matters of this kind must admit that the half-tones of to-day are much better than those of five years ago.

Still, on the other hand, while the quality has been improved, the price has been reduced in much greater proportion than the proportionate increase of improvement. I believe that I am right in saying that the average price of half-tones five years ago was about 30 cents an inch; to-day the average price on half-tones is 15 cents an inch. In other words, the price has dropped fifty per cent. and the quality is fully one hundred per cent. better.

Now, whose fault is this? I sincerely believe that it is no one's fault but the photo-engraver's. How it has happened is well known—the photo-engraver simply lets it happen and does nothing to remedy it, neither does he do anything to stop the many abuses to which he is subjected.

For instance, a customer, who has considerable work, will come in and ask a price on half-tones and is quoted a rate. Then the prospective customer informs the photo-engraver that he can do much better than that,—that the Tom, Dick and Harry Co., around the corner, will quote him a price 2 cents lower an inch. Rather than have the order slip through his fingers, the photo-engraver will meet that price and there you are. This has not only been done all over the country for the past few years, but is being done at the present day. It is not only this one reduction in price, but the next time that this man comes in, he will try it again and goes still lower.

When half-tones dropped from 50 cents to 40 cents and 30 cents and finally to 25 cents, everyone thought that they would remain at that price. As long as photo-engravers will sit by idly, doing nothing to prevent this continuous drop in prices, the

time will come when the price on half-tones will be as low as on zinc etchings.

The question may arise in the minds of some readers how it is possible that the work is done so cheaply. I would like to have someone answer this, for I have been trying to do so for the last few years, and up to this time have not been able to do so. Tell me why it is that photo-engravers will do a job at 15 cents—yes, even lower than that—when they know that they are going to lose money on it, and simply hope to get an order at a good price next time. The next time they find they must go still lower or possibly at the same rate. Instead of making money, they exist from hand to mouth. Why do photo-engravers permit a thing of this kind? It can be readily remedied. Let them unite and adopt a minimum rate for all classes of work; minimum rate on half-tones and a minimum rate on zinc etchings. Then as to the question of how much to charge for vignetting and retouching. Sometimes a customer will come in and say that he will give you the order provided you will do the vignetting or retouching free of charge. Now how ridiculous it is to make such a request. It is just the same as going into a clothing store and asking the price on a suit, and finally, with the understanding that the tailor will give you the coat and vest, only purchasing a pair of trousers. The fact is, that the engraver who vignettes the half-tone, or the artist who retouches the copy, receives so much per hour, just the same as the photographer or the etcher receives so much for making half-tone negatives or for etching same. Why should we be paid for one man's labor and not for another's?

Why should engravers all over the United States offer to make sketches on approval? For instance, here is a man in Podunk, who is about to get out a set of illustrations. He has fifty illustrations, all of which are to be made from descriptions drawn up for half-tone reproduction. In other words, fifty wash drawings. The man sends in a letter, requesting a sample illustration to be submitted with price, and if price and sample are satisfactory, the order will be placed for same. This man sends five of these letters to Chicago; ten to New York, and a few to Cincinnati and St. Louis; a dozen to Philadelphia, etc., until he has fifty engravers competing on this order. Taking it for granted that fifty engrav-

Reproduction from Monochrome Drawing.

By St. Louis Photo-Engraving Co.,
St. Louis, Mo.

ing firms will prepare a sample drawing for the sake of getting this order,—the cost of each drawing we will say is worth $10.00. That is not very much for the photo-engraver. It is only $10.00. He sends in his sample drawing and makes a price. A plate 4 x 5 is 20 square inches; at 20 cents per square inch, this amounts to $4.00,—for fifty plates, $200.00. However, the drawing comes to $10.00 and fifty of them will be $500.00. Now let us see how much these fifty plates and fifty drawings cost the publisher. He receives the fifty drawings, which are satisfactory. They do not cost him one cent, but he decides to give the order to the cheapest man. We will say that the order is placed at 20 cents a square inch. In other words, he is willing to pay the engraver $200.00 for fifty engravings. He has not paid one cent for the drawings, which was the greatest expense. Instead of paying $700.00 for a set of illustrations, he has only paid $200.00, and the engravers will be foolish enough to give $500.00 worth of work for nothing, as they were anxious to get the job. This may seem a little overdrawn, nevertheless it is a fact. If the American photo-engravers would stand together and abide by certain rules and regulations and say that they will not make a design without a certain deposit being made on said order, it would stop these abuses which cost the engraver thousands of dollars every month.

There is another abuse to which we are subjected, and that is giving the customer something for which we get nothing. A great many photo-engravers charge half-tones by the square of the proof instead of by the square of the block. You know that lumber costs us so much, and that copper costs us so much per pound, and that every bit of waste that goes into the scrap pile costs us so much money. It is necessary to have an edge on half-tones in order to mount them. The customer gets this edge, therefore why should he not pay for it. However, I understand that among the ten photo-engraving associations now existing in the United States, most of them have adopted this plan of measurement and are measuring by the square of the block, and the customer does not object.

There are many other things that I could mention, but space will not permit me to go into detail here, and I will close by simply stating that as President of the Chicago Association of Photo-

Engravers, I will be pleased to have the photo-engravers of America correspond with me, and if I can be of any service to them in forming an association in their city, I shall be glad to do so. Where a year ago only one association was in existence, we to-day have ten.

The " BUSINESS END " of the photo-engraving business must be looked after just as much as any other business, whether it is a bank, the dry-goods business, or any other business for that matter. The trouble is that the business end of the photo-engraving business is not looked after as it should be. If it was, the price of half-tones would not have dropped from 30 cents to 15 cents; and if photo-engravers do not come to time and do something, the price will go down and down until the price on half-tones will be as low as on zinc etchings.

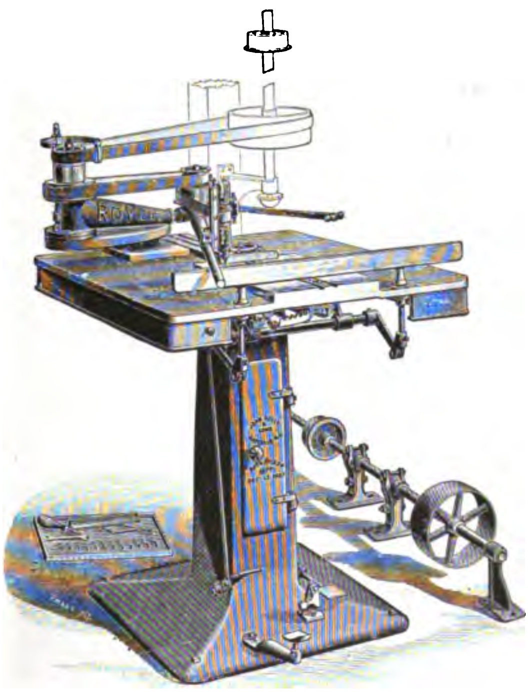
I hope that photo-engravers reading this article will give it a few moments' thought; sit down quietly and think it over, and see whether Binner is talking through his hat or not, and then when Mr. Harrison gets out his Annual for '98, I will have another paper on " THE BUSINESS END OF THE PHOTO-ENGRAVING BUSINESS," and if nothing is done now to prevent these many abuses, instead of receiving 15 cents for half-tones, we will be talking about 7 cents and 8 cents. Don't try to get cheap prices for good work, or good prices for cheap work.

WORK-ROOM HINTS FOR PROCESS-ENGRAVERS.

By "Actinic."

AS every engraver knows, the etching of process-plates is one of the most difficult and exacting of operations. To get sufficient depth, and at the same time retain sharpness of line, demands the closest attention and the exercise of the maturest judgment. This is peculiarly the case where broad spaces have to be deeply etched so as to show white in printing. In such cases the acid is very apt to eat beneath, and undermine, the protected parts of the surface, causing them to break away and leave a rough, jagged line.

Fortunately, it is very seldom necessary to etch very large spaces with acid, the routing machine doing the work far better



MOVABLE-ARM ROUTING MACHINE.

and faster, and without any of the objectionable features of the acid. Except through the awkwardness of the operator, lines are never broken down in routing. The motion of the router being direct and continuous, the outline of the cut necessarily conforms accurately to the sweep of the cutter, and such a thing as undercutting and breaking down the lines is out of the question.

While routing machines are very generally used and are pretty thoroughly understood by engravers, it is the purpose of the present article to offer a few suggestions which may possibly be of value to those not versed in work-room practice.

Considering the nature of the work done, the care of a router is a very simple matter indeed. It is, of course, necessary to keep it clean and to see that the bearings are properly oiled, but, aside from this, there is little or nothing to be done. The oiling of the cutting spindle is the most important item. In the high-grade Royle machines, the spindles have a speed of about 15,000 turns per minute. This is very fast running, and if there should be the slightest friction between the bearings and the spindle, a dangerous degree of heat might be developed, ending in serious damage to the spindle. To obviate trouble of this sort, care should be taken that the spindle be at all times properly lubricated. It is not alone sufficient that quantities of oil be poured on, regardless of its nature and qualities. Only selected oils, mixed especially for high-speed work, should be used, and those of the best grade obtainable. Many oils that serve admirably on slow-running machines are absolutely worthless for high-speed work, being too heavy and viscous, and without the evenness and free-running qualities that are essential where the conditions exist that are present in a router.

An oil of the following composition has been recommended for use on router spindles:

Standard Oil Company's Bayonne Oil	9 parts
Pure Blown Rape	1 part

Mix together, heating to about 110° F., taking care that they blend thoroughly. The rape-seed oil must be absolutely pure and of the best quality.

It is entirely unnecessary to flood the spindle with oil. Much better results will be obtained if the supply is limited to the

From a Painting in Black and White.

By T. C. LINDSAY.

Engraved by
R. J. McFEE & Co.,
Cincinnati, O.

actual requirements, feeding steadily and regularly but not excessively.

Under pretty much any circumstances, a spindle running at the rate of 15,000 revolutions per minute is liable to get heated, but no alarm need be felt so long as it is possible to rest the hand on the bearing without discomfort. When it becomes so hot as to burn the fingers, the danger point has been reached, and immediate steps should be taken to determine and correct the difficulty.

The matter of belts for the router cannot be too carefully attended to. All finely-built machines are liable to be affected by

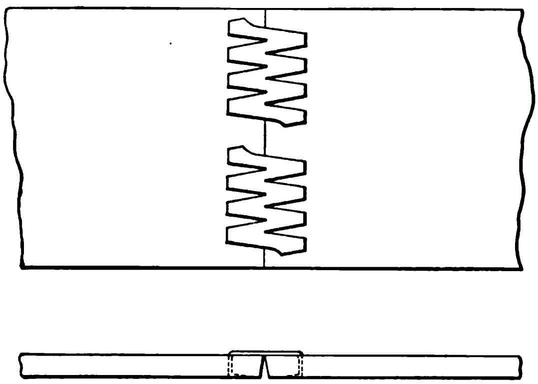


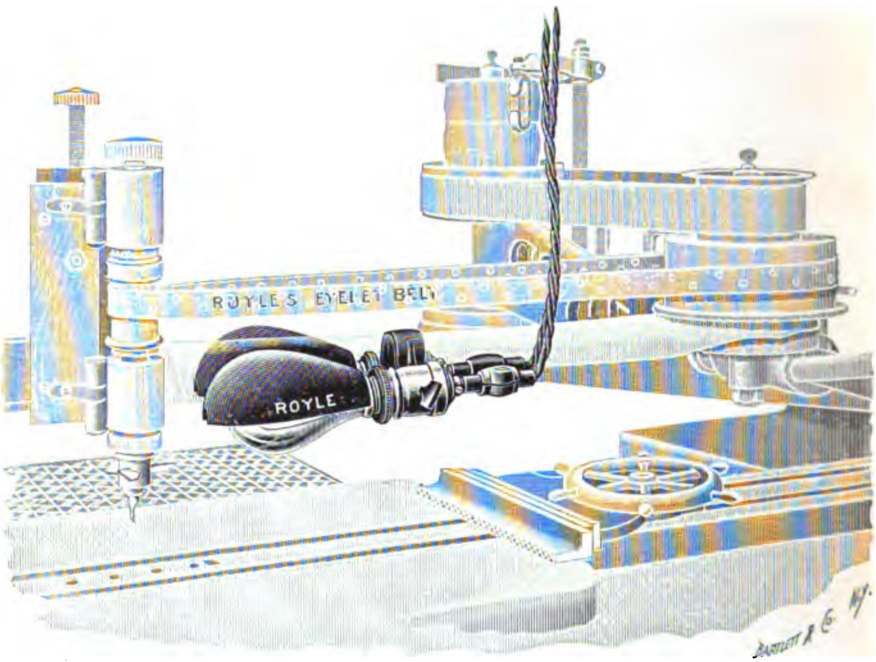
FIG. 1.

irregularities in the medium used to drive them, and the router is no exception to the rule. All belting should be of the best quality, and should be shaved to an even thickness throughout its entire length. For driving between intermediate points on the machine, endless, cemented belts should be used exclusively, but for driving from the countershaft, a belt fastened with patent steel lacing, as shown in Fig. 1, will be found very satisfactory.

The router being set up and running, it now remains to begin operations, and at this point the selection of the cutter best adapted to the work it is proposed to do becomes of the first importance. Wood, zinc, copper, brass, electrotype metal, etc., are all handled on the router, and experience has shown that such widely different substances demand tools varying equally in form. Wood, zinc, and the soft metals permit of the use of a fluted cutter of large size and considerable clearance. These cutters work very smoothly and rapidly, but the cutting edge is not sufficiently

strong to withstand the strain of working in the harder metals. For hard zinc and brass, flat-faced cutters, with short blades, are used; while for copper, the fluted form gives the best results, but the cutters are made much stronger than those used in metals less tough of grain.

It is highly desirable, at times, to rout out very fine lines and spaces; hence many of the cutters used are very small and fragile. Those sold by reliable makers, however, are always made of the very highest grades of steel, and are tempered by the most ap-



ELECTRIC LAMP BRACKET, FOR LIGHTING TABLE OF ROUTER.

proved methods, so that, if carefully handled, they will generally last, without breaking, until worn out. The greatest danger of breaking the cutters exists when they are entering or leaving the work, and the operator should see to it that at these times the bar is moved slowly and evenly, and is firmly held to prevent sudden jarring or twisting of the cutter. A very little care in this will save a great deal of money in the course of a year, and while it would seem that the advantages of taking the very ordi-

nary precautions suggested should be self-evident, it is surprising how many operators persistently use these delicate, highly-tempered pieces of steel as though they were crow-bars, running up big bills for their employers, and quietly shifting the responsibility off on to the shoulders of the makers of the cutters. Another fertile cause of breakages of cutters is that the spindles are allowed to become shaky, the end-play not being properly taken up as it develops. No cutter could be made that would last for any length of time in such a spindle, and if cutters snap and break without any apparent reason, the condition of the head and spindle should be immediately and carefully looked into.

To cut clean and free, the cutter must be kept keen, and the plates or blocks be firmly clamped to the bed of the machine. Routers can be used either on type-high blocks or on thin, unmounted plates. In routing the latter, it is sometimes found that they are uneven, frequently being slightly bowed-up in the centre. To obviate all trouble from this source, plates of unusual size should be first mounted on blocks and then routed, the superior facility with which the routing can be done in this way more than compensating for the trifling amount of time consumed in the blocking.

Good routing, like everything else, is largely a matter of personal skill and dexterity, but with very little practice indeed, a man of ordinary intelligence and fair control over his muscles can learn to handle a machine very acceptably. Of course, to do the very finest kind of routing, special attention must be given to it, but there is a great deal of work in engraving establishments that does not call for more than a fair degree of skill, and it is the facility with which the operation of the machine can be mastered that has led to its very general adoption. An engraver doing a small business, and personally handling every part of the work, can, in a few days, without any special effort, make sufficient headway in mastering the art of routing to be able to use the machine to good advantage.

In selecting a router, care should be taken to secure a machine that can be relied upon. Poorly-built routers cost more in the end than well-built ones, and can never be depended on to do the work at critical moments. The router is a difficult machine to build, as it must unite strength, speed, and delicacy of execution, and give the same service year in and year out.

HALF-TONE DIRECT FROM NATURE.

By William Gamble.

I THINK that, in the near future, the tendency will be towards making half-tone negatives for photo-engraving direct from the natural objects, rather than from a print. I am aware that a good deal is done already in this way, but it is a method not resorted to so much as it ought to be. My opinion is that any process which saves one or more steps in the course of reproduction is not only valuable as a saving of time, but must tend to render a better result, for it is obvious the more times a subject is copied the less likelihood will there be of getting the full tonality and detail of the original picture. Captain Abney has instanced a case in which you may go on copying and recopying a print from copy to copy until you have only got two tones—high light and shadow. This is a reason for the chalkiness or the flatness of a good deal of the half-tone work of to-day.

Setting aside direct half-tone in the studio from portable objects, which is fairly easy of accomplishment, let us consider how far it will be possible to take the camera out of doors and afield to make negatives which can be printed direct on to copper or zinc. It may be mentioned, by way of preface, that collotype and photogravure are direct methods, inasmuch as the original negatives may be used, but they are too slow. What is wanted is a process adapted for letter-press printing. There are practical difficulties in the way of interposing the usual ruled screen and taking the negatives in the ordinary way of the half-tone process. Granting that dry plates are used, and that a fairly compact camera can be devised with the screen in a traversing carrier in the back part of the camera, so that ordinary dark slides can be used, there is the difficulty of the enormous amount of light cut off, and the necessity of using comparatively small stops. This means prolonged exposures, and puts out of the question moving objects or moving foliage. Added to this it would be difficult to hit the exact exposures which would close the high lights just right.

It is possible that the solution of the problem may lie in adopting a different form of screen, such as would, for instance, lie closer

Above the Clouds.

Photograph by O'KEEFE & STOCKDORF.
Engraved by
SANDERS ENGRAVING CO.,
St. Louis, Mo.

to the sensitive plate, and permit of the use of a larger stop. In this connection it is interesting to note that Deville, in his recently published very able paper on the theory of the screen, suggests a chequer-board screen and a vignetted screen as both likely to be available in reducing the exposures. By a vignetted screen is meant one in which the lines or dots taper off into less density at their edges. Such a screen being placed in contact with the dry plate, it is immaterial what size the stop, so long as it is not excessively large. The advantage of the chequer-board screen is that several apertures can be pierced in the diaphragm and the exposure correspondingly shortened.

Another way suggested for utilizing the original negative is to take from it a transparency on a sensitive plate which is already impressed with the print of a screen, and from this to make the ordinary half-tone negative. This idea of a preliminary exposure through a screen has been varied in several ways, some experimenters thinking it possible to so impress the sensitive plate for the original negative. I cannot quite see how it is to be done practically, but a compromise which would shorten the exposure would be to flash a sheet of white cardboard or paper in front of the lens and within its angle, so as to get the central part of the dot before the regular exposure begins.

If the grain is not obtained in the camera it is possible it might be got in the printing frame. I had a fair amount of success some four or five years ago with a process of placing silk gauze between the negative and the sensitive plate, and I improved on it with film screens made from ruled-glass screens. This process might be termed a full-tone one, as it yielded high lights and full shadows, with a nice gradation between, if the negative was made right for it.

There is altogether a good field for experiment in these methods of securing half-tones direct from nature—or, if that is not precisely attainable, let us try to get them as direct as possible.

COLOR BY MEANS OF PHOTOGRAPHY.

BY A. C. AUSTIN.

"Attempt the end and never stand to doubt;
Nothing 's so hard, but search will find it out."

COLOR in photography, the apparently chimerical dream of the early workers, is almost an actuality; nay, is an actuality, if we may accept the indirect for the direct. Science has wrestled with the problem, and after many weary years is able to say, "Here is color by means of photography." That true-color photography will follow as surely as the day follows the night is but the question of a little while. What has been done is the powerful incentive to what may be accomplished, and failures are but stepping-stones to success. At present we have color by means of photography, and the commercial demand for this method is almost unparalleled in comparison with any other means of illustration. The application of the process to business requirements is evidenced on every side, and the successful workers find plenty of orders to occupy their time. People are quick to realize the beauty and to appreciate the utility of the product. As a consequence of all this, coupled with the general plethora of ordinary half-tone work, which has materially reduced prices and minimized profits, process workers are generally reaching out to embrace this new-comer and turn the demand to their own advantage. That all are not successful is small wonder, for very few realize the difficulties that beset the way, and although the conquering of these difficulties may be part of the grand economy of general advancement, they are yet hard to bear individually, and realizing this only too well in the light of past experiences, the desire to be helpful to others prompts me to point out what I believe may be expected of the process in its present development and to explain a few facts in connection that are the outcome of these experiences.

In order to do this intelligently I must necessarily begin with the first operations and trace them each to completion along the generally accepted lines. You will observe that I say "generally accepted lines." I would be honest with the readers of the ANNUAL, and I believe that on general lines they will find what

I say to be true and of practical value. Certain special advantages which I and my co-workers have learned I do not feel should be gratuitously imparted, at least during the period when we are competing in business.

The making of three-color value negatives is the cardinal point and almost wholly depends upon the selective properties of the color filters. There is such a decided difference between the visual and the chemical power of the filter that it requires a deal of time and patient investigation to determine this difference and to harmonize it to any given plate. That the power lies in the filter and not in the plate has been clearly proven, and the only benefit that a specially prepared plate has over the ordinary one is in its superior sensitiveness to the red end of the spectrum and the consequent shortening of the exposure. Just as good a negative can be made on an ordinary plate through a red filter as can be done on the orthochromatic, although the exposure would be many times longer. It must be said, however, that the color filter used for the orthochromatic plate is hardly adapted to the ordinary.

Experience has demonstrated to some of us the best plate and the best filter, and in practise the results are acceptable.

Red, green, and violet are the names by which the filters are commonly known, and although these names are not literally correct they yet serve the purpose. Each filter is constructed by means of suitable aniline colors, and if properly prepared, both as to color and density, should perform the following functions:

The red filter should suppress the greens, the blues, and the violets, and the resulting negative would be the basis for a print in blue ink. The green filter should suppress purple, red, and violet, and the print would be made in red ink. The violet screen in like way retards the action of the reds, the yellows, and the greens, and the print would be in yellow.

Each negative must, however, be most carefully timed, for the least over- or under-exposure would materially change the relative values of the passed and suppressed colors, and no amount of after-manipulation could restore the loss.

From the three properly balanced negatives it is now necessary to make three equally careful positives, which in turn give way to the half-tone negatives and the etchings.

I bar out the collotype method, for, while it may be more cor-

rect than the half-tone, it is nevertheless wholly impracticable because of the impossibility of making a quantity of prints with any degree of uniformity. Nearly every photographer of experience will contend that the glass positive is superior to paper, and I would not attempt to gainsay this statement; but I have found in actual practise that prints on paper offer better field for manipulation and can be made so as to retain all that it is possible to retain in the half-tone etching. There is a natural loss in all reproductive methods, and this loss is amplified by the various stages, but by the exercise of care and good judgment it should not be greater in tri-color than in monochrome.

Matters would be much simplified if we could only make the color value and the half-tone negative in one, but that end has not yet been accomplished.

In making the half-tone negatives the cross-lined screen is used in preference to the single line, and the effect of line at the given angle is obtained by means of the special diaphragm, cut at an angle of forty-five degrees in the direction of the screen-line and in the form of a greatly elongated ellipse. The direction of the line for the yellow plate is generally either horizontal or perpendicular, and the red and blue plate-lines each about thirty degrees beyond the other. This angle of difference in line between each of the three plates wholly obviates any tendency to pattern in the superimposing of the prints. The line formed by the elliptical diaphragm is undulating to a certain extent, or it may be likened to a string of sausages, and it possesses the decided advantage of merging to a stipple in the high lights, and thereby gives opportunity for fine etching with good effect on the copper plate. That this fine etching is essential in color work goes without saying, but a word of caution is necessary right at this point. Much can be made and much undone by the etcher. Experience and good judgment in the weighing of values are absolute requisites to correct fine etching, and how much to subdue the one color or the other needs careful consideration. Intelligent practise and studious observation of results are great teachers.

In the printing, one make of ink should be decided upon and used exclusively. Get some standard product that is uniform in its manufacture—that the color of to-day is as exact in shade as that of to-morrow, so that, when the color-filters and the ink accord, the quality of work may be unvaried. Unless this is done

Photograph.

Mummified Hand of an Egyptian Princess, obtained near the Tombs of the Kings, Thebes, 1892.

Radiograph

of same, made on a Carbutt X-Ray Plate, by JOHN CARBUTT.

The hand is believed to be between 3000 and 4000 years old.
Half-tones: Etched using Carbutt Process Plates.

you will be continually guessing. And with all use white paper to print on, as cream or natural coated paper tends to change the value. White litho-plate paper with a hard finish is the most satisfactory paper that I know of at present.

We must not expect everything in the process just yet. If results are nearly correct we should feel pleased; but we must not hesitate, because the process is photographic and because we may feel that photography should do it all, to use any means at our command for the betterment of the plates. To entirely cut away the yellow and red, leaving only the blue printing for the sky of some landscape, is perfectly legitimate. Anything and everything is legitimate that tends to betterment. Constant careful study will be rewarded by improvement, which is but a step from perfection.

GENERAL VON EGLOFFSTEIN, THE INVENTOR OF HALF-TONE.

By Stephen H. Horgan.

AMONG my collection of steel- and copper-plate prints is a recent acquisition, one I treasure most of all. It is a proof of an experimental half-tone plate made in 1866. Besides its rarity—for there were but few of its kind printed—and the fact that it is one of the best of the early attempts at half-tone, it might have an additional value when it is considered that a large portion of $200,000 was expended in producing it. On an adjoining page is presented an ordinary zinc plate reproduction of it, enlarged to double its actual size without any retouching or re-engraving. This of course magnifies all its defects while it enables one to study the method of making it.

This half-tone idea originated with Baron Frederick von Egloffstein probably in the fifties, for in the summer of 1861 he secured the services of Mr. Samuel Sartain, the celebrated steel-engraver of Philadelphia, in ruling the glass screens. These screens were ruled in wavy lines 250 lines to the inch and finer.

The first gun in Fort Sumter, however, fired the Baron's mili-

tary spirit, for he had been an officer in the Prussian army, and he went into the war. He was seriously wounded while serving as Colonel of the 103d Regiment New York Volunteers under Burnside. He came out of the war a Brevet Brigadier-General of Volunteers. He immediately applied for a patent on his invention. This discloses his method sufficient to find that he made his half-tone screens as they are made in some cases to-day. The steel plate to be engraved was sensitized with an asphaltum coating, then exposed to light under a positive of the ruled-glass screen for one half the time required to render the asphaltum insoluble. This partially-exposed plate was subsequently exposed under a positive of the subject for the remaining time required to render the asphaltum completely insoluble. Later he used the screen in the camera, but this was kept a secret.

Some years since, I undertook engraving on steel by the half-tone method, and, after succeeding, learned for the first time that the idea had been thought of and worked out by Von Egloffstein many years before. Since then I made diligent inquiry to learn the history of Von Egloffstein's venture, but owing to the dark secrecy that was maintained regarding every detail of his methods and the grave now covering all that remains of himself and associates, there are but few facts to find. Such as have been disclosed are traditional and are recorded here for the future historian.

General Von Egloffstein's first idea was to apply his process to the reproduction of works of art. His earliest patron was Archbishop McCloskey of New York, afterwards the first American Cardinal. At this time a plate appeared by his process, being a reproduction of a rare engraving of one of Murillo's Madonnas, titled *The Immaculate Conception.* Probably not finding art reproduction profitable, he turned his attention to the problem of engraving by his photographic method the government bank-notes thus to prevent counterfeiting, which was disagreeably prevalent at that time. Baron Gerolt, the Prussian minister at Washington, introduced him to the leading men at the Capitol, and not long after was formed "The Heliographic Engraving and Printing Co.," occupying the whole building at No. 135 West 125th Street, New York.

Here was inaugurated a system of secrecy regarding every part of the work performed. The establishment was honey-combed with rooms, each devoted to a small detail of the process, but the

REPRODUCTION OF A HALF-TONE OF THIRTY YEARS AGO.

(Enlarged twice the size of original print.)

occupants of one room were not allowed to enter or know what was done in the next room. So loyal were the employés to their military chief that to their dying day they kept to themselves the portion of the secret imparted to them.

Among the men who assisted Von Egloffstein at this time were those of national fame like Hon. Salmon P. Chase, Senators Sprague and Morton, Captain Eads, and Mr. Schumacher, the wealthy merchant of Baltimore. Jay Cooke & Co. were the bankers for the company, and the first year $150,000 was spent, and still there are but a few prints like the one reproduced herewith to show for that great expenditure.

Of the causes of Von Egloffstein's failure we can only conjecture, but the chief one was his being too far advanced for his time. He undoubtedly had the correct idea of half-tone engraving, but in his day there was but one method of printing he could use, and that was what we term copper-plate printing. The paper, ink, presses, and workmen were not in existence to print relief plate half-tones as they do to-day. He was compelled to make incised plates. That our government rejected his method of bank-note engraving is not discreditable to him. He only met the fate of other worthy inventors. The government sought his aid as a civil engineer, however, and he died in its service. To his many other honorable and military titles has been added that of "The Father of Half-tone," and he deserves it.

TIMING HALF-TONE NEGATIVES.

By H. Woodbury Shaylor, Jr.

WHEN I was making half-tone negatives I found that I needed something, while timing my negative, in order not to forget the time the exposure began. Oftentimes during an exposure, I would find it necessary to attend to other work, and in this way I would forget how much time I had given the negative.

"Necessity being the mother of invention," I thought of a little scheme which has been a great help to me. If your watch crystal is loose enough to move, on the inside of the crystal make

a little line with asphaltum which will point to the minute marks, and as this line can be turned around so as to point to any of the minute marks, it is easy to determine exactly how long an exposure you have given your negative, providing at the beginning of the exposure you set the line so that it registers exactly with the minute hand. It is especially advantageous when the exposure is quite long and you happen to start when the minute hand is between a space that marks five minutes.

It is much more convenient than a dial, as a dial is usually tacked somewhere on the wall, and to see how long an exposure you have made you have to look at both the dial and your watch, while in my case I only have to give one glance at my watch and can readily see how much time has elapsed.

Another little scheme I used, while etching, was an alarm clock, as I did not care to handle my watch with my hands covered with different chemicals.

I glued a small piece of wood about a quarter of an inch square on the centre of the glass that covers the face of the clock. I then cut out a hand of wood, about the same length as the minute hand, and screwed that to the small block so that my wooden hand could be turned so as to register with the minute hand.

This enables me to work the same scheme as I described with my watch.

SUBSTRATUM FOR COLLOTYPE PLATES.

By Y. Isawa.

NEARLY every one who is interested in photography probably knows the principles of the collotype process. It is not new at all; still it may be of some interest for those who are going to experiment in the process. The entire process of collotype consists of four different stages of operations: 1, preparation of substratum for sensitive coating; 2, coating with sensitized gelatine and drying; 3, printing on plate from reversed negative, and development of image; 4, printing from plate in greasy ink.

Of these four operations, the first is the most important, or, at

least, as important as the other three. When I was experimenting in the process, I encountered great difficulty in getting a proper substratum. There are many manuals which minutely treat about all other operations, but there are not many which fully treat of the operation of producing the substratum.

Here I propose to write a few practical hints of this operation. Take patent plate-glass not thinner than three-eighths of an inch and ground on one side with emery powder and water. Upon this ground surface of glass we place the substratum for the sensitive coating. This substratum is made of a mixture of silicate of soda and stale beer, or of a mixture of silicate of soda and albumen. Of these the silicate of soda is the most important. There are three kinds of silicate of soda on the market: (a) the very pure, which is a transparent thick solution; (b) a light brown syrup; (c) impure and in stiff jelly form, of light chocolate color. For collotype, the last-mentioned cheap kind is the most useful, but in case this inferior kind cannot be procured, the second quality may be substituted, but it is not so reliable. As to the purest kind, there is no use employing it—that is, in case one can obtain the impure ones at reasonable prices. Indeed, I am willing to pay a higher price for the latter than for the pure ones.

With this cheapest kind of silicate you can get a most reliable substratum, there being no fear of frilling of film in the press. This cheap silicate as it is bought from the dealer is too stiff and almost dry, so it must be made into proper jelly and kept in stock. To do this, take two or three pounds of silicate, put in a large jar and pour over it about twice as much of its bulk of water. Put this jar in a pan of hot water and stir until it has been dissolved; then cool it and keep in stock. For use we make the following solution:

Stale German Beer	10 ounces.
Stock Jelly of Silicate of Soda	2 ounces.

or

Albumen	6 ounces.
Stock Jelly of Silicate of Soda	4 ounces.
Water	10 ounces.

In either formula put all ingredients into a large bowl, beat briskly, and, in case of using albumen, beat it into froth. Set

de for awhile to settle, then filter twice through muslin; use mediately, as it will not keep.

It is most important to be able to judge whether the prepared lution is suitable or not, because we are not quite sure of the sulting solution until it is done. Improperly mixed solution ever should be used. The solution should look translucent and omewhat turbid, but should not have any sediment, nor be ransparent. If you use solution improperly mixed, failure is ure to result.

Before coating, the plate should be thoroughly cleaned on the ground side with a mixture of alcohol and ammonia, as for the old collodion process; then rinse under tap and put on rack to drain, as many plates as there are. When all plates have been cleaned in this way, take the first one from the rack, hold it flat on the left hand, and with the right flow over the plate a mixture of one part of each of alcohol and ammonia and ten parts of water; pour on as much as the plate will hold, and rock the plate two or three times. Pour off the solution from remotest end of the plate, and flow the plate with silicate solution from nearest end of the plate, so as to drive the remaining solution before. Then put the plate on a leveling stand and flow on the same mixture, as much as the plate will hold without spilling. At all operations take care that the silicate solution does not run back of the plate as it will not come off after drying, and makes a cloudy appearance which prevents even exposure of the back of plate in printing, thus making its appearance when printing in greasy ink.

Leaving the first one on the leveling stand, we go on for the second plate; do the same as before, and put on second leveling stand. The plate on the first leveling stand being taken down and the surplus of solution being drained off from one end, the plate is put on the rack to drain. Now third, and then fourth, as many as there are plates. When all have been done, take the first plate from rack, it being not perfectly dry. Taking this on flat of hand with the end of plate which was upside on the rack being away from the operator, flow the plate again with silicate solution and drain on rack with the remote end of the plate down; leave it to dry. The drying may be aided by heat. When it is perfectly dry it should look translucent, having some gloss, and looking not perfectly dry; yet it is quite dry and shows no sign of tackiness on touching, and shows no precipitate.

When it is as described, put the plates in clean cold water and wash with about three changes of water, leaving five minutes for a time; rinse under tap, and put on rack to dry. When dry it should appear a milky color, having a trifle of gloss when it is properly prepared.

Sometimes it appears of a milky color but having no gloss, but of a powdery look, which is caused by the use of improper beer. Sometimes it appears all right, but the coating is in patches or in circular spots; this is caused by improper cleaning of glass. It looks well when dry, but is tacky and will nearly wash off in water; this is caused by improper proportion of ingredients. Try, first, reducing the quantity of silicate. Sometimes it is otherwise all right but has a feathery precipitate all over, which is caused by improper mixing of ingredients. An entirely new solution must then be made.

Miss Mischief.

Photograph by STRAUSS.
Engraved by
TEACHENOR-BARTBERGER ENG. CO.,
Kansas City, Mo.

Photographic Tables and Formulas.

DRY PLATE DEVELOPERS.

PYROGALLOL.

CLIMAX PLATE.

A.

Water	80 ounces.
Sulphite (E. A.)	6 "
Pyro	1 "

B.

Water	80 ounces.
Carbonate soda (E. A.)	6 "

To use, take equal parts of A and B. In warm weather a little less carbonate may be used, and developer can be reduced with water. For over-exposure, use a few drops of a ten per cent. solution of bromide of ammonium.

Do not use an excess of sulphite of soda, simply enough to control color in the negative. Too much gives a cold, poor printing film.

M. R. HEMPERLEY'S FORMULA.

A.

E. A. Pyro	1 ounce.
Oxalic acid	10 grains.
Water	12 ounces.

B.

Sulphite of soda .... 40 Hydrometer.

C.

Carbonate of potash, carbonate of soda, 15 hydrometer.

To develop take one drachm of A, one-half ounce of B, one-half ounce of C, and one ounce of water.

DAVIS AND SANFORD'S FORMULA.

Carbonate of soda	60 Hydrometer.
Sulphite of soda	40 "

E. A. Pyro	1 ounce.
Water	12 ounces.
Oxalic acid	16 grains.
Sulphuric acid	10 drops.

For use take

Sulphite of soda solution	½ ounce.
Carbonate of soda solution	½ "
Pyro solution	½ drachm.
Water	3 ounces.

CRAMER PLATES.

Alkaline Solution.

Water	60 ounces	or	1800 cc.
Carbonate of sodium crystals (sal soda)	5 "	"	150 grams.
Sulphite of sodium crystals	10 "	"	300 "

A smaller quantity of sulphite will produce a warmer tone, a larger quantity a gray or bluish black tone.

The alkaline solution must be kept in well-stoppered bottles.

If the negatives show a yellow stain make a fresh solution, or try another lot of sulphite of sodium.

For hydrometer test see note below.*

Pyro Solution.

Distilled or pure ice water	6 ounces	or	180 cc.
Sulphuric acid	15 minims	"	1 cc.
Sulphite of sodium crystals	1 dram	"	4 grams.
Pyrogallic acid	1 ounce	"	30 "

All pyro solutions work best while fresh.

Eight grains dry pyro may be substituted for 1 dram of this solution.

* The alkaline solution can be made with the hydrometer by mixing equal parts of the following solutions:

Carbonate of sodium solution....(hydrometer test 40).
Sulphite of sodium solution.....(hydrometer test 80).

Mix in the following proportions:

Pyro solution	1 dram or	10 cc.
Alkaline solution	1 ounce "	80 cc.
Tepid water (for winter use)	2 ounces "	160 cc.
or:		
Cold water (for summer use)	3 to 5 ozs. "	240 to 400 cc.

If the high lights are flat, use more pyro solution.

If they are too intense, use less pyro solution.

If too little pyro is used the alkali will be in excess and cause fog.

For negatives of great contrast, suitable for line engraving, use double the quantity of pyro solution, and add sufficient bromide of potassium solution to keep the lines perfectly clear.

For Transparencies.

Water	64 ounces.
Sulphite of soda	8 "
Carbonate of soda (crystals)	2½ "
Bromide of potassium	30 grains.

To every ounce of this solution add 3 to 5 grains of dry pyro. An excess of pyro will yield slides too heavy in the shadows and lacking in detail in the high-lights.

CARBUTT'S.

No. 1.

Pyro Stock Solution.

Distilled or ice water	10 ounces or	300 cc.
Oxalic acid	15 grains "	1 gram.
Bromide of potassium	30 " "	2 "

Then add Schering's pyro 1 ounce (30 grams), and water to make 16 fluid ounces (480 cc.).

No. 2.

Stock Soda Solution.

Water	10 ounces or	300 cc.
Sodium sulphite (crystals)	4 " "	120 grams.
Soda carb. crystals (or dry gran. 1 ounce),	2 " "	60 "
Potash carbonate	1 " "	30 "

Dissolve, and add water to make measure 16 fluid ounces (480 cc.).

No. 3.

Bromide Solution.

Bromide of sodium or potassium, ½ ounce (14 grams). Water, 5 ounces (150 cc.).

For Developer.

Dilute 2 ounces of stock No. 2 with 7 ounces of water for cold weather, and 10 to 12 of water in summer. To 3 ounces of dilute No. 2 add 1½ to 2½ drams (6 to 10 cc.) of No. 1. The more pyro the denser the negative, and *vice versa*. No yellowing or fogging need be apprehended if the directions are followed. Development should be continued until the image seems almost buried, then wash and place in fixing bath.

For Instantaneous Exposures take for a 5x8 or 6½x8½ plate 3 ounces of dilute No. 2. Lay the plate to soak in this, and cover pan. Put 2 drams of No. 1 into the graduate, and 3 drops of bromide solution. Pour the soda solution off of the plate into the pyro and back over the plate; let development proceed, and examine occasionally. Keep solution in gentle motion over the plate. A *very* short exposure may take ten minutes to fully develop. If the image is not fully brought out by this time, add to developer in pan three times its bulk of water, and let plate lie in it covered for half an hour or more if necessary, until full develment is attained, then wash, and proceed as directed under head of developer.

HAMMER.

No. 1.

Oxalic acid	15 grains or	1 gram.
Water	32 ounces "	960 cc.

Dissolve, and add

Pyrogallic acid	1 ounce or	30 grams.

No. 2.

Sulphite of sodium (crystals)	8 ounces	or 240	grams.
Carbonate of sodium (crystals)	4 "	" 120	"
Water	32 "	" 960	cc.

To develop, take 1 ounce (30 cc.) of No. 1, 1 ounce (30 cc.) of No. 2, and 8 ounces (240 cc.) of water.

By Hydrometer Test.

No. 1.

Sulphite of sodium solution....................60 hydrometer.

No. 2.

Carbonate of sodium solution..................60 hydrometer.

To develop, take 1 ounce of No. 1; ½ ounce of No. 2; pyro solution, as above, 1 ounce; water, 8 ounces.

Pyro and Ammonia.

No. 1.

Water..	16 ounces.
Meta-bisulphite of potash.........................	60 grains.
Pyrogallic acid..................................	1 ounce.

No. 2.

Water..	16 ounces.
Sodium sulphite (crystals).........................	3 "
Potassium bromide...............................	40 grains.
Stronger water ammonia.........................	1 ounce.

No. 3.

Water..	16 ounces.
Potassium bromide..............................	½ ounce.

To develop, take 1 dram each of Nos. 1, 2, and 3, and 4 ounces of water.

Seed.

No. 1.

Distilled or good well water........................	16 ounces.
Sodium sulphite (crystals).........................	4 "
Pyrogallic acid..................................	1 ounce.

No. 2.

Water..16 ounces.
Sal. soda (crystals)................................ 4 "

To develop, take No. 1, ¾ ounce; No. 2, 1 ounce; water, 8 ounces.

BY HYDROMETER TEST.

No. 1.

Take of clear sodium sulphite solution, testing 60 with
hydrometer...................................18 ounces
Pyrogallic acid................................. 1 ounce.

No. 2.

Sal. soda solution, hydrometer test..........................40

To develop, ¾ ounce No. 1; 1 ounce No. 2; 8 ounces water. More water gives flatness, and less water contrast. Use less water in cold weather. About 10 drops of sulphuric acid added to the stock pyro solution will make it keep better.

AMERICAN.

No. 1.

Pyrogallic acid.................................. 1 ounce.
Sulphite of sodium (crystals).......................60 grains.
Sulphuric acid, C. P...............................15 minims.
Water.. 6 ounces.

No. 2.

Sulphite of sodium (crystals)...................... 2 ounces.
Sal. soda.. 1 ounce.
Water..40 ounces.

To develop, use No. 1, 1 dram; No. 2, 4 ounces. For more intensity, use more of No. 1; for more detail, more of No. 2.

BY HYDROMETER TEST.

Make sulphite of soda solution to test 30; make sal. soda solution to test 10; mix together in equal parts. To develop take

pyro solution as in previous formula, 1 dram; soda solution, 4 ounces.

EASTMAN (for films).

No. 1.

Pyrogallic acid	½ ounce.
Nitrous or sulpurous acid	20 minims.
Water	32 ounces.

No. 2.

Sulphite of soda (crystals)	6 ounces.
Carbonate of soda (crystals)	4 "
Water	32 "

To develop, take No. 1, 1 ounce; No. 2, 1 ounce; water, 2 ounces.

THOMAS.

No. 1.

Pyrogallic acid	1 ounce.
Sodium sulphite	4 ounces.
Citric acid	¼ ounce.
Potassium bromide	¼ "
Distilled or boiled water to make	20 ounces.

No. 2.

Carbonate of soda	6 ounces.
Water, to make	20 "

Take one drachm of each solution and 6 drachms of water to make each ounce of developer.

WUESTNER'S EAGLE.

No. 1.

Water	84 ounces.
Sodium sulphite (crystals)	16 "
Pyrogallic acid	2 "
Sulphuric acid	10 drops.

No. 2.

Water	84 ounces.
Sal. soda	8 "

To develop, take 2 ounces of No. 1, and 2 ounces of No. 2, and add 8 ounces of water.

METACARBOL.

Metacarbol	25 grains.
Sulphite of soda (crystals)	100 "
Sodium hydrate (caustic soda)	50 "
Water	10 ounces.

Dissolve the metacarbol in the water, add the sulphite of soda, and, when this is dissolved, add the sodium hydrate and filter. With this developer the time of exposure is considerably reduced.

Another formula, recommended by John Strathmann, is:

A—Metacarbol (dissolved in 3⅓ ounces water)	25 grains.
Sulphite of soda (15 Hydrometer)	3⅓ ounces.
B—Sodium hydrate (20 Hydrometer)	

For use take

A	2 ounces.
B	1 ounce.
Water	3 ounces.

For under-timed plates use more of B. For over-timed plates use less of B, or use old developer.

HYDROQUINONE.

Carbutt.

A.

Warm distilled water	20 ounces	or	600 cc.
Sulphite soda (crystals)	4 "	"	120 grams.
Sulphuric acid	1 dram	"	4 "
Hydrochinon	360 grains	"	23½ "
Bromide potass	30 "	"	2 "
Water to make up to	32 ounces	"	960 cc.

Radiograph of Rattlesnake.

From Negative by J. A. LeRoy.

B.

Carbonate potash....................	2 ounces or	60 grams.
Carbonate soda (crystals)...........	2 "	" 60 "
Water to make.......................	32 "	" 960 cc.

C.

Accelerator.

Caustic soda........................	1 ounce or	30 grams.
Water...............................	10 ounces "	300 cc.

For under-exposure add a few drops of above to developer.

D.

Restrainer.

Bromide potass......................	½ ounce or	14 grams.
Water...............................	5 ounces "	150 cc.

To Develop.

For instantaneous exposures, take—*A*, 1 ounce or 30 cc.; *B*, 1 ounce or 30 cc.; *water*, 4 ounces or 120 cc.

For portraits—*A*, 1 ounce or 30 cc ; *B*, 1 ounce or 30 cc.; *water*, 5 ounces or 150 cc.

For landscapes (Sen 20–27)—*A*, 1 ounce or 30 cc.; *B*, ½ ounce or 15 cc.; *water*, 3 ounces or 90 cc.

For landscapes, full exposure (Sen 16–20)—*A*, 1 ounce or 30 cc.; *B*, ¾ ounce or 25 cc.; *water*, 4 ounces or 120 cc.

For lantern slides—*A*, 1 ounce or 30 cc.; *B*, ¾ ounce or 25 cc.; *water*, 4 ounces or 120 cc.

For lantern slides and full exposures—*A*, 1 ounce or 30 cc.; *B*, ¾ ounce or 25 cc.; *water*, 4 ounces or 120 cc.; and 2 to 6 drops. Restrainer *D* to each ounce of developer. (See below.)

Note.—More of *A* will increase density, more of *B* will increase detail and softness. Temperature of developer should not vary much below 65 degrees nor above 75 degrees. The after-treatment is the same as with any other developer.

For Lantern Plates, Process Plates, and Large Transparencies.

No. 1.

Hydrochinon Solution.

Water (distilled or boiled) warm....................	10 ounces.
Sulphite of soda crystals...........................	1 ounce.
Sulphurous acid.....................................	½ "

Mix with 2 ounces cold water and add slowly to the sulphite solution, then add:

Hydrochinon	100 grains.
Bromide potassium	30 "
And water to make the whole measure	15 ounces.

No. 2.

Alkali Solution.

Water	3 ounces.
Carbonate soda crystals	1 ounce.
Carbonate potash	½ "
Water to make the whole measure	5 ounces.

To form developer, mix one part No. 2 with three parts No. 1.

CRAMER.

For producing great contrast and intensity, and for developing over-exposed plates.

No. 1.

Distilled or ice water	25 ounces.
Sodium sulphite (crystals)	3 "
Hydroquinone	½ ounce.
Potassium bromide	¼ "

No. 2.

Water	25 ounces.
Sodium carbonate	6 "

To develop, mix equal parts of Nos. 1 and 2.

SEED.

A

Hydrochinon	1 ounce.
Sulphite of soda (crystals)	5 ounces.
Bromide of potassium	10 grains.
Water (ice or distilled)	55 ounces.

B.

Caustic potash	180 grains.
Water	10 ounces.

To Develop.

Take of A, 4 ounces; B, ½ ounce. After use pour into a separate bottle. This can be used repeatedly and with uniformity of results by the addition of one drachm of A and 10 drops of B to every 8 ounces of old developer.

In using this developer it is important to notice the temperature of the room, as a slight variation in this respect causes a very marked difference in the time it takes to develop, much more so than with pyro. Temperature of room should be from 70 to 75 degrees Fahr.

BYK'S.

Hydroquinone	5	grams.
Potassium carbonate	75	"
Sodium carbonate	40	"
Water to make	1,000	"

Mix in reverse order. Use full strength.

DR. JUST'S.

No. 1.

Hydroquinone	10	parts.
Sulphite of sodium	60	"
Distilled water	240	"

No. 2.

Carbonate of potassium	120	parts.
Acetic acid	15	"
Distilled water	480	"

To develop, mix the solution in equal parts for use. The best results are obtained by commencing development with an old or once-used developer, and, when development is half-completed, applying fresh.

MIETHE.

No. 1.

Sulphite of soda	35 grams.
Yellow prussiate of potash	30 "
Hydroquinone	7 "
Water	550 cc.

No. 2.

Caustic potash	30 grams.
Water	550 cc.

To develop, use 3 parts of No. 1, and 2 to 3 parts of No. 2, according to exposure and desired density.

EDWARD'S.

Carbonate of sodium (granulated)	100 grains.
Sulphite of sodium (crystals)	480 "
Hydroquinone	100 "
Water	14 ounces.

Use full strength.

DR. PIFFARD'S.

Sodium sulphite	480 grains.
" carbonate	960 "
Hydroquinone	96 "
Water	16 ounces.

Mix and filter. This developer may be used repeatedly.

EIKONOGEN.

No. 1.

Water	40 ounces.
Sodium sulphite (crystals)	2 "
Eikonogen (finely powdered)	1 ounce.

No. 2.

Water	10 ounces.
Potassium carbonate	1 ounce.

To develop, take 3 ounces of No. 1, and 1 ounce of No. 2. As a restrainer, use a few drops of a ten per cent. solution of potassium bromide.

HAMMER.

Solution No. 1.

Pure hot water.......................................45 ounces.
Sulphite of sodium (crystals)........................ 3 "

Dissolve, and add

Eikonogen.. 1 ounce.

Boil five minutes; when cool, filter.

Solution No. 2.

Pure water.......................................15 ounces.
Carbonate of potassium...........................1½ "

For use, take three parts of solution No. 1 and one part of solution No. 2.

Make stock solution of sulphite of soda 40 by hydrometer.

No. 1.

Hot water.......................................30 ounces.
Sulphite of soda solution (40 hydrometer test)........10 "
Eikonogen.. 1 ounce.

To develop, take Nos. 1 and 2, equal parts.

No. 2.

Carbonate of soda solution (12 hydrometer test).

Bromide Solution.

Pure water.......................................10 ounces.
Bromide of potasium.............................. 1 ounce.

When the developing solution is quite new, it may be necessary to add to it 6 to 12 drops of the bromide solution to make it work perfectly clear.

AMERICAN.

No. 1.

Sulphite of soda (hydrometer test 30)................40 ounces.
Eikonogen.. 1 ounce.

No. 2.

Potassium carbonate to test 10°.

To develop, use equal parts. For more contrast use more of No. 1. For more detail use more of No. 2.

WUESTNER'S EAGLE.

No. 1.

Water	80 ounces.
Sodium sulphite (crystals)	3½ "
Oxalic acid	1 dram.
Eikonogen	2½ ounces.
Yellow prussiate of potash	½ ounce.

No. 2.

Water	20 ounces.
Potassium carbonate	2 "

To develop, take 4 ounces of No. 1 and ½ ounce of No. 2.

EIKONOGEN AND HYDROQUINONE.

CLIMAX.

No. 1.

Water, distilled or ice	40 ounces.
Eikonogen	336 grains.
Hydroquinone	144 "
Sulphite of soda (crystals)	3 ounces.

No. 2.

Water, distilled or ice	40 ounces.
Sulphite of soda (crystals)	1 ounce.
Carbonate of soda	4 ounces.

For use mix 2 ounces No. 1, 1 ounce No. 2. Can be used over and over by adding a little fresh developer each time. Any amount of density may be obtained with this developer by varying the proportions and a normal exposure. A few drops of 10 grain solution bromide of ammonium may be used to start off with on first plate; after that regulate by using more or less of old developer in the new.

Carbutt's.

A.

Distilled water	20 ounces	or	600 cc.
Sulphite of soda (crystals)	4 "	"	120 grams.
Eikonogen	330 grains	"	22 "
Hydrochinon	160 "	"	10½ "
Water to make up to	32 "	"	960 cc.

B.

Distilled water	20 ounces	or	600 cc.
Carbonate of potash	2 "	"	60 grams.
Carbonate of soda (crystals)	2 "	"	60 "
Water to make up to	32 "	"	960 cc.

To develop, see Carbutt's hydroquinone developer.

Seed.

No. 1.

Distilled or pure well water	32 ounces.
Sodium sulphite (crystals)	4 "
Eikonogen	240 grains.
Hydrochinon	60 "

No. 2.

Water	32 ounces.
Carbonate of potash	4 "

To develop, take

No. 1	2 ounces.
No. 2	1 ounce.
Water	2 ounces.

By Hydrometer Test.

No. 1.

Sodium sulphite solution to test 30	34 ounces.
Eikonogen	240 grains.
Hydrochinon	60 "

Carbonate of potash solution to test 50.

To develop, take

No. 1	2 ounces.
No. 2	1 ounce.
Water	2 ounces.

For Lantern Slides and Transparencies.

No. 1.

Distilled water	20 ounces.
Sodium sulphite (crystals)	1 ounce.
Citric acid	20 grains.
Eikonogen	120 "
Hydroquinone	60 "

No. 2.

Distilled water	20 ounces.
Caustic potash	120 grains.
Potassium bromide	120 "

To develop, take two parts of No. 1 and one of No. 2.

HAMMER.

Hot water	60 ounces.
Sodium sulphite (crystals)	3 "
Eikonogen	1 ounce.
Hydroquinone	60 grains.
Potassium carbonate	1½ ounces,

or 3 ounces of sodium carbonate (crystals).

To develop, take equal parts of above solution and water. Less water gives more density and contrast.

ROOT'S DEVELOPER.

No. 1.

Water	64 ounces.
Sodium sulphite (crystals)	2½ "
Eikonogen	1 ounce.
Hydroquinone	⅛ "

Blanche Walsh as "Trilby."

Photograph by MORRISON.
Engraved by
HAGOPIAN PHOTO-ENGRAVING CO.,
3 Great Jones St., New York.

No. 2.

Water	64 ounces.
Potassium carbonate	2½ "

To develop, take two parts of No. 1, and one part of No. 2.

FERROUS OXALATE.

Neutral oxalate of potash, saturated solution. Protosulphate of iron, sat. sol. 10 drops sulphuric acid.

To Develop.

Oxalate solution	10 ounces.
Iron solution	2 "
Old (used) developer	2 "

METOL.

CRAMER.

Thoroughly dissolve:

Metol	1 ounce.
In water	60 ounces.

Then add

Sodium sulphite (crystals)	6 ounces.
Sodium bicarbonate	3 "

SEED.

No. 1.

Water	8 ounces.
Metol	100 grains.
Sodium sulphite (crystals)	1 ounce.

No. 2.

Water	10 ounces.
Potassium carbonate	1 ounce.

To develop, take 1 ounce of No. 1, 1 ounce of No. 2, and 5 ounces of water.

METOL AND HYDROQUINONE.

CRAMER.

Thoroughly dissolve:

Metol	¼ ounce.
Hydroquinone	¼ "
In water	80 ounces.

Then add

Sulphite of soda (crystals)	4 ounces.
Carbonate of soda (crystals)	2½ "

To prepare this with hydrometer, mix

20 ounces sulphite of soda solution, testing 60
20 " carbonate of soda solution, " 30
¼ ounce metol, ¼ " hydroquinone, } dissolved in 40 ounces water.

For summer use, dilute the developer with an equal quantity of water, also for large plates, so that the development does not proceed too rapidly and can be properly controlled.

SEED.

No. 1.

Water	16 ounces.
Metol	30 grains.
Hydroquinone	30 "
Sodium sulphite (crystals)	240 "

No. 2.

Water	10 ounces.
Potassium carbonate	120 grains.

To develop, take 1 ounce of No. 1, 1 ounce of No. 2, and 1 ounce of water.

AMIDOL.

Water	10 ounces.
Sodium sulphite (crystals)	120 grains.
Amidol	20 "

This developer should always be used fresh.

Water	8 ounces	or	240 cc.
Sulphite of soda (crystals)	800 grains	"	52 grams.
Amidol	80 "	"	5 "

To develop, take four parts of water and one part of amidol solution.

GLYCIN.

Glycin	5 parts.
Sodium sulphite	15 "
Potassium carbonate	25 "
Water	90 "

For use, dilute with 3 to 4 volumes of water.

FIXING BATHS FOR PLATES.

Sodium hyposulphite	2 ounces.
Water	10 "

Sodium hyposulphite	2 ounces.
Acid sulphite of soda	½ ounce.
Water	10 ounces.

This bath is somewhat reducing in its action, and will be found useful in clearing muddy or stained negatives.

HEMPERLEY'S.

Take thirty-two ounces sulphite of soda (hydrometer test 60), add to this one ounce sulphuric acid very slowly, and eight ounces solution of chrome alum (hydrometer test 60), then add the whole to two gallons saturated solution of hypo, and it is ready for use.

Leave the negative a few minutes longer in the bath than is required for fixing. This is important, as the permanency of the negative depends upon it. Don't use a flat tray to fix in; it causes spots and dirt; use a grooved box.

LABORIE'S.

Bisulphite of soda	100 grams.
Hyposulphite of soda	150 "
Water	1,000 cc.

Carbutt's.

Sulphuric acid	1 dram	or	4 cc.
Hyposulphite of soda	16 ounces	"	480 grams.
Sulphite of soda	2 "	"	60 "
Chrome alum	1 "	"	30 "
Warm water	64 "	"	1,920 cc.

Dissolve the hyposulphite of soda in 48 ounces (1440 cc.) of water, the sulphite of soda in 6 ounces (180 cc.) of water, mix the sulphuric acid with 2 ounces (66 c.) of water, and pour slowly into the sulphite of soda solution, and add to the hyposulphite, then dissolve the chrome alum in 8 ounces (240 cc.) of water and add to the bulk of solution, and the bath is ready. This fixing bath will not discolor until after long use, and both clears up the shadows of the negative and hardens the film at the same time.

After negative is cleared of all appearance of silver bromide, wash in running water for not less than half an hour to free from any trace of hypo solution. Swab the surface with wad of wet cotton, rinse, and place in rack to dry spontaneously.

American

Citric acid	160 grains.
Hyposulphite of soda	1 pound.
Water	32 ounces.

First dissolve the citric acid, add the hypo and allow to settle.

Cramer.

The negatives may be fixed in a plain hypo bath, 1 part hyposulphite of soda to 4 parts of water, but the following bath is especially recommended.

Prepare two solutions.

No. 1.

Hyposulphite of soda	48 ounces.	
Water	96 "	(3 quarts.)

No. 2.

Water	32 ounces.
Add, gradually, sulphuric acid	¼ ounce.
Sulphite of sodium crystals	4 ounces.
Chrome alum	2 "

After the ingredients are dissolved, pour No. 2 solution into No. 1.

DURING THE COLD SEASON, ONE-HALF THE QUANTITY OF NO. 2 IS SUFFICIENT.

When the bath becomes weakened by constant use, it must be replaced by a new one. Prepare solutions No. 1 and 2 in advance (allowing plenty of time for the chemicals to dissolve) so as to have them ready when wanted.

This bath combines the following advantages: It remains clear after frequent use, does not discolor the negatives, forms no precipitate upon them, and hardens the gelatine to such a degree that the negatives can be washed in warm water, provided they have been left in the bath a sufficient time.

The plate should be allowed to remain in the bath five to ten minutes after the bromide of silver appears to have been dissolved. The permanency of the negative and freedom from stain as well as the hardening of the film depend upon this.

SEED.

No. 1.

Water	96 ounces.
Sodium hyposulphite	2 pounds.
Sodium sulphite (crystals)	4 ounces.

No. 2.

Water	32 ounces.
Chrome alum	2 "
Sulphuric acid	¼ ounce.

Pour No. 2 into No. 1 while stirring rapidly.

WUESTNER'S EAGLE.

Add to 100 ounces saturated solution of hypo;

3 ounces of a 10 per cent. chrome alum solution.

(1 oz. chrome alum, 10 ozs. water.)

3 ounces of a saturated solution of sulphite of soda, crystals.

½ ounce of a saturated solution of oxalic acid.

INTENSIFICATION.

CLIMAX.

No. 1.

Bromide of potassium.............................. 1 ounce.
Water...16 ounces.

No. 2.

Bichloride of mercury.............................. 1 ounce.
Water ....16 ounces.

No. 3.

Sulphite of soda..............................strong solution.

To intensify, soak plate well in water and then immerse plate in No. 1 for about five minutes; then pour off and flow plate with No. 2 till desired intensity is obtained. Wash well and immerse in No. 3 till plate resumes its natural color. Wash well and then dry.

CRAMER.

Prepare a saturated solution of bichloride of mercury in water and pour of this a sufficient quantity gradually into a solution of
Iodide of potassium..............................1¼ ounces.
Water...6 ounces.
until the point is reached, when the forming red precipitate will no longer dissolve by shaking, but be careful not to add more mercury than just enough to make the solution very *slightly* turbid. Now add
Hyposulphite of soda..............................1 ounce.
dissolve and add water to make 20 ounces solution.

For use, this should be diluted with about three parts of water. If the plate has not been thoroughly fixed, the intensifying solution will produce yellow stains. Be careful not to overdo the intensifying. Should it have gone too far, the negative can be reduced by placing it in the fixing bath for a short time.

CARBUTT.

With correct exposure and development, intensification need never be resorted to. The following formula is, however, very effective, and the most permanent of all methods:

No. 1.

Bichlor. mercury	240 grains	or 16 grams.
Chloride of ammonium	240 "	" 16 "
Distilled water	20 ounces	" 600 cc.

No. 2.

Chloride of ammonium	240 grains	or 16 grams.
Water	20 ounces	" 600 cc.

No. 3.—*Cyanide Silver Solution.*

Distilled water	6 ounces	or 180 cc.
Cyanide potass. C. P.	60 grains	" 4 grams.
Distilled water	2 ounces	" 60 cc.
Nitrate of silver	60 grains	" 4 grams.

Pour the silver into the cyanide solution while stirring, and mark bottle "Poison."

Let the plate to be intensified wash for at least half an hour, then lay in a 5 per cent. solution of alum for ten minutes, and again wash thoroughly; this is to insure the perfect elimination of the hypo. The least trace of yellowness after intensifying shows that the washing was not sufficient.

Flow sufficient of No. 1 over the negative to cover it, and allow to either partially or entirely whiten; the longer it is allowed to act the more intense will be the result; pour off into the sink, rinse and flow over No. 2, and allow to act one minute; wash off, and pour over or immerse in No. 3 until changed entirely to a dark brown or black. No. 3 can be returned to its botttle, but Nos. 1 and 2 had better be thrown away. Wash thoroughly and dry.

AMERICAN.

No. 2.

Bichloride of mercury	31 grains.
Water	4 ounces.

No. 2.

Sulphite of soda (crystals)	154 grains.
Water	3 ounces.

The negative is laid in No. 1 until intensified sufficiently and washed thoroughly, then put in No. 2, when it returns to the original color. Wash for one-half hour and dry.

Scolik's Method.

The fixed and well-washed negative is allowed to remain in the following mercuric chloride bath until the film is thoroughly whitened:

Mercury bichloride	1 part.
Potassium bromide	1 "
Water	50 parts.

The bleaching being complete, the mercuric solution is rinsed off, and the negative is immersed in a mixture of equal parts of a saturated solution of sodium sulphite and water. Finally, wash well.

Liesegang's Method.

No. 1.

Sulphate of copper	75 grains.
Potassium bromide	75 "
Water	6½ ounces.

No. 2.

Nitrate of silver	90 grains.
Water	4 ounces.

Place negative for ten minutes in No. 1, wash it for five minutes and immerse it in No. 2 until blackened.

REDUCTION.

Dissolve 1 part red prussiate of potash in 15 parts of water. Wrap the bottle in yellow wrapping-paper, as the solution is affected by light and will not keep long. Immerse the negative in a hypo solution—1 part hypo to 15 parts of water—to which has been added a little of the above immediately before use. When reduced sufficiently, wash thoroughly.

Cyanide Reducing Solution.

Cyanide of potassium	20 grains.
Iodide of potassium	10 "
Bichloride of mercury	10 "
Water	10 ounces.

Child Study.

Photograph by E. C. DINTRUFF.
Engraved by
BRAMBLETT & BEYGEH,
Minneapolis, Minn.

Reduction takes place slowly and is easy to control. After reducing, the negative should be washed thoroughly.

No. 1.

Hyposulphite of soda (crystals)	772 grains.
Water	8 ounces.

No. 2.

Ferricyanide of potassium	76 grains.
Water	6 drams.

To reduce, use No. 1, 5 ounces; No. 2, 2 drams.

Potassium ferricyanide	1 ounce or 30 grams.
Distilled or melted ice water	16 fluid ounces or 500 cc.

Keep the above solution in the dark when not in use. To reduce a negative, immerse it in hypo solution of a strength of about one ounce of hypo to a pint of water, to which a small quantity of the reducing solution has been added. To reduce locally, immerse the plate for a few minutes in water and apply the mixed solution with a camel's-hair brush to the part required. Silver stains may also be removed after wetting the plate by brushing them over with the solution. At the end wash thoroughly. The ferricyanide solution must be added to the hypo at the time of using, as the mixed solutions do not keep.

BARTLETT'S REDUCER.

Perchloride of iron	30 grains.
Citric acid	60 "
Water	1 pint.

Saturated solution of potassium ferricyanide	1 part.
Sodium hyposulphite solution (1 : 5)	10 parts.

After reduction, wash the negative thoroughly.

DEVELOPMENT POINTERS.

A Developer containing a surplus of alkali effects more detail in the shadows and lessens the intensity of the high lights, which

causes more softness in the negative, consequently such a Developer suits well for under-exposed plates, which explains why for under-exposures a preliminary bath in a soda solution or ammonia solution is used to advantage.

A large quantity of developing substance, such as pyro, eikonogen, metol, hydrochinon, and glycin, quickly intensifies the high lights, hastens the development, so that the shadows remain far behind, wherefore a modification by little over-exposure, dull lighting, or soft-working plates is of good service.

The Developer diluted with water slows the process of development, gives the shadows more of a chance to work through before the high lights have gained their strength, prevents contrast, and therefore is recommendable for contrasty plates or under-exposure.

The old or used Developer acts the same as bromide, checks the development, and clears, and is used when plates are greatly over-exposed or a general fog is apparent.

The room in which plates are handled and developed must be a perfectly dark room, save for the light from a small ruby or orange-colored window (or one containing a combination of these colors), by which the progress of development can be watched. If possible, have an abundance of pure running water, and provide good ventilation. You will have better negatives and better health by so doing.

The window in your dark room which illuminates the sensitive plate during the process of development must be as non-actinic as possible. There is no such thing as a perfectly safe light. Any light of sufficient illuminating power to be of practical use will affect a very sensitive plate, if given time enough; it is therefore necessary to use great care in developing. The best and safest light for your dark-room window is a combination of ruby glass and orange paper, commonly called post-office paper. This is easier on the eyes than ruby glass alone, and by its use the quality of the negative may be more easily determined. Use a lamp or gas-jet outside to illuminate the window, as it is safer and more uniform than daylight.

A soft camel's-hair brush may be used to remove the dust from plates before placing them in the holder or dark slide. If the brushing is done hurriedly, the film will be instantly electrified and attract to itself more dust than you remove.

When plates are exposed and set away for future development, be sure to set them *face to face*, as they were in the original boxes. If the face or film is placed against the back, you will probably have finger-marks on the film, caused by the fingers coming in contact with the backs of the plates while placing them in the holder.

It is advisable to use a fresh solution of Hyposulphite of Sodium each day during the hot weather. The fresh solution hardens the film, and alum will not be necessary.

Thorough fixing and thorough washing, followed by quick drying, will insure permanency and fine printing quality in the negative.

To prevent sand or rust from striking the negatives while washing, tie a piece of cotton flannel over the faucet.

Negatives exposed to white light before the bromide of silver is thoroughly dissolved in the fixing solution will be foggy, and the printing quality will be injured.

A solution of bromide of potassium (one ounce of bromide to ten ounces of water) should be in every developing-room. When plates are a little over-exposed, a few drops of this solution added to the Developer will restrain its action, and may thus produce a good negative from what would otherwise be a worthless plate.

DEFECTS IN NEGATIVES.

FOGGY NEGATIVES.—Caused by over-exposure; white light entering camera or dark-room; too much light during development; decomposed pyro; introduction of hypo or nitrate of silver into the developing solution from the fingers or from tablets used for wet plates; developer too warm or containing too much carbonate of soda or potassium.

WEAK NEGATIVES WITH CLEAR SHADOWS.—Under-development.

TOO STRONG WITH CLEAR SHADOWS.—Under-exposure.

WEAK NEGATIVE WITH PLENTY OF DETAIL IN THE SHADOWS.—Want of intensity, caused by over-exposure. Shorter exposure with longer development will, in most cases, produce sufficient intensity, and an addition of more pyro stock solution to the developer will seldom be necessary.

FINE TRANSPARENT LINES.—Using too stiff a brush in dusting off plates.

TRANSPARENT SPOTS AND PIN-HOLES.—Dust on plate or in camera, or scum on old developer, or air bubbles while developing. Developer must be perfectly clean.

CRYSTALLIZATION ON THE NEGATIVE AND FADING OF IMAGE.—Imperfect elimination of the hypo.

YELLOW COLORED NEGATIVES are caused by not using enough sulphite of sodium in developer, or if the article used is old and decomposed.

YELLOW STAINS are caused by using old hypo bath which has assumed a dark color, or by not leaving plate in hypo bath long enough.

MOTTLED APPEARANCE OF NEGATIVE is caused by precipitation from fixing bath containing alum, if the solution becomes old or if it is turbid.

ORTHOCHROMATIC SENSITIZING BATHS.

VICTOR SCHUMANN.

Distilled water	200	parts.
Alcohol	10	"
Ammonia, .900	4	"
Alcoholic solution of cyanine (1.200)	10	"

Immerse the plate in water containing a little ammonia (3 pts. per 100) for two or three minutes, and then place in the above solution, drain and dry.

MALLMAN AND SCOLIK.

Preliminary Bath.

Water	200	cc.
Ammonia	2	"

Soak the plate for two minutes.

Color Bath.

Erythrosin solution, 1 : 1000	25	cc.
Ammonia	4	"
Water	175	"

The plate should not remain longer in this bath than one and a quarter minutes. A longer time reduces the general sensitiveness.

Alcohol	500 cc.
Chinoline red	1 gram.

To which add 50 cc. of a solution of

Alcohol	500 cc.
Chinoline blue (cyanine)	1 gram.

The above solution is identical with the liquid dye sold under the name " Azaline."

Bathe the plates for about two minutes by a very feeble red light in

Erythrosin solution (1 : 1000)	50 parts.
Distilled water	100 "
Silver nitrate solution (1 : 1000)	50 "
Ammonia (Sp. gr. 0.96)	2 "

Keep this solution in the dark room. These bathed plates will remain clear for about seven days.

Color Screen.

Aurantia	0.3 parts.
Warm alcohol	50 "
Ether	50 "
Pyroxiline	2 "

Dissolve the aurantia (not aurine) in the alcohol, then add the ether and pyroxiline and filter. Coat thin polished plate glass and attach to inner side of lens board. If not dense enough, coat again or use two screens together. The darker the screen the longer the exposure, but the better the orthochromatic effect.

TONING FORMULAS.

Aristo-Platino Paper.

Negatives should be fully timed and slowly developed. Print to good depth. Tone first in a plain gold bath, made slightly

alkaline with borax, to a point which is reached immediately after the whites have cleared up. Then wash through three changes of water and tone in a platinum bath prepared as follows:

Stock Solution.

Water	2 ounces.
E A. Platinite	15 grains.
Phosphoric acid (50 % sol.)	2½ drachms.

To tone, take one drachm of above stock solution to twenty ounces of water; if this is not strong enough to give the desired tones in six to eight minutes, add more stock solution.

Aristo Junior Paper.

Print until the high lights are well tinted. Wash out all free silver by five changes of water. Tone in a plain gold bath made slightly alkaline with borax. Speed of bath six to eight minutes. Fix in a plain hypo bath, testing twelve by the hydrometer, for ten minutes.

Aristo Blue Label Paper.

Print but slightly deeper than desired when finished. Wash in five changes of warm (not hot) water. On pouring off last warm water, allow the prints to stand in cold water while waiting to be toned. Tone in any good gold bath, of such strength as to require six to eight minutes for a warm tone to be reached. As prints come from toning bath, place them in a tray of water made slightly acid with acetic acid. Fix in hypo bath, 10 to 12 hydrometer test, or one ounce of a saturated solution of hypo to every 16 to 18 ounces of water.

Albumen Paper.

Chloride of gold	1 grain.
Acetate of sodium	30 grains.
Water	8 ounces.

This must not be used till one day after preparation. It keeps well, and gives warm, rich tones.

Chloride of gold	1 grain.
Bicarbonate of sodium	4 grains.
Water	8 ounces.

This is ready for immediate use after preparation, but it will not keep.

Chloride of gold	1 grain.
Phosphate of sodium	20 grains.
Water	8 ounces.

This gives rich tones of a deep purple nature, but must be used soon after preparation.

Gold solution	10 drams.
Acetate of lime	20 grains.
Chloride of lime	1 grain.
Tepid water	20 ounces.

The "gold solution" before mentioned is prepared by neutralizing as much as is required of a one-grain solution of chloride of gold by shaking it up with a little prepared chalk, then allowing it to settle, and filtering off the clear liquid. This toning bath improves by keeping. To use, add two ounces of it to eight ounces tepid water, which will prove sufficient to tone a full-sized sheet of paper.

Chloride of gold	15 grains.
Water	5 ounces.

Neutralize with lime water, make up to fifteen ounces with water, and add two drams of chloride of calcium. This stock solution will keep for a long time. For use, dilute one ounce with ten ounces of water.

Combined Toning and Fixing Baths.

Hyposulphite of soda	3 ounces.
Nitrate of lead	60 grains.
Chloride of gold	6 "
Water	24 ounces.

GAEDICKE.

Hyposulphite of soda	200 grams.
Boric acid	30 "
Lead nitrate	15 "
Sulphocyanide of ammonium	20 "
Chloride of gold (1 : 200)	60 cc.
Water	1,000 "

Chloride of gold	1 grain.
Phosphate of sodium	15 grains.
Sulphocyanide of ammonium	25 "
Hyposulphite of sodium	240 "
Water	2 ounces.

Dissolve the gold separately in a small quantity of water, and add it to the other solution.

No-gold Combined Bath.

Hypo	6 ounces.
Washing soda	¼ ounce.
Lead acetate	½ "
Water	1 quart.

KALLITYPE PRINTING PROCESS.

Sensitizing Solution.

Ferric oxalate	75 grains.
Silver nitrate	30 "
Water	1 ounce.

This solution is swabbed over the paper with a wad of cotton wool, and the paper is dried before a clear fire. The above quantity will coat about ten square feet of smooth paper. Printing is done as usual with the platinotype process.

Developing Solution.

Rochelle salts	1 ounce.
Saturated solution of borax	10 ounces.

A Winsome Maid.

Photograph by MEDLAR.
Engraved by GATCHEL & MANNING
PENNSYLVANIA ELECTRO PHOTO-TYPE
ENGRAVING CO.,
33 South Sixth St., Phila., Pa.

Restrainer.

One per cent. solution of potassium bichromate.

After development the prints are washed in three or four changes of water, and then placed in the

Fixing Bath,

which consists of a one per cent. solution of ammonia in water.

BLUE PRINT FORMULAS.

No. 1.

Citrate of iron and ammonia	$1\frac{7}{8}$ ounces.
Water	8 "

No. 2.

Ferricyanide of potassium	$1\frac{1}{4}$ ounces.
Water	8 "

Mix equal parts of No. 1 and No. 2, and apply with brush or by floating for three minutes. Plain Rives paper should be used; hang up to dry in darkened room.

Black Lines upon a White Ground.

Water	9 ounces.
Gelatine	3 drams.
Perchloride of iron solution (U. S. Ph.)	6 "
Tartaric acid	3 "
Ferric sulphate	3 "

Filter off any precipitate that may be found, and coat any good, stout white paper with the full strength solution. Expose in sunlight till details or lines are visible, and develop with

Gallic acid	6 drams.
Alcohol	$6\frac{1}{2}$ ounces.
Water	32 "

Wash well in several changes of water.

The sensitizing solution is as follows:

Gum arabic	15 grams.
Tartaric acid	2 "
Chloride of sodium (common salt)	9 "
Sulphate of iron	10 "
Iron perchloride	15 "
Water	110 cc.

In mixing the solution, the gum arabic is first dissolved in the water by the aid of heat, and the other salts are added while the solution is still warm.

The solution is spread over the surface of the paper with a sponge, and, after allowing a little time for it to penetrate the surface, all superfluous moisture is removed, using the sponge again, well wrung out. If this precaution be not attended to, the depth of the lines is not equal. The paper is then dried as quickly as possible. If the drying is not rapid the whites stain.

Exposure is somewhat longer than would be needed with sensitized albumenized paper. The color of the sensitized paper is yellow. During exposure all but the lines turns to white.

Development is by a plain aqueous solution of gallic acid, the strength of which is not important. Care must be taken not to leave the print too long in the developer, otherwise staining will result. After development the print is rapidly washed, when superfluous moisture is carefully sponged off the surface. If this precaution be not observed, inequality in the depth of the lines will result.

MOUNTANTS.

Best thin glue	3 ounces.
Golden syrup	¾ ounce.
Alcohol	3 ounces.
Water	3 "

Soften the glue in 2 ounces of the water; heat gently in a pan of hot water, add the syrup (refined molasses), add the other ounce of water to the alcohol and pour into the jar under constant stirring.

Jarecki's.

A

Wheat flour	3½ ounces.
Water	8 "

B

Salicylic acid	15 grains.
Water	12 ounces.

Stir the flour with the eight ounces of water. Boil the other twelve, add the salicylic acid and stir in A.

Non-Cockling Paste.

Nelson's No. 1 gelatine	4 ounces.
Water	16 "
Glycerine	1 ounce.
Alcohol	5 ounces.

Dissolve the gelatine in the water, then add the glycerine, and then the alcohol.

MISCELLANEOUS FORMULAS.

To Clean Negatives Stained by Silver.

Take a plug of cotton-wool and wet it well with a weak solution of cyanide of potassium ; rub gently all over the negative, using a little more force on the stained parts. Well wash. Dry on blotting-paper. If necessary to revarnish, flood the plate once or twice with methylated spirit. Let dry, and then varnish in the ordinary way.

To Remove Silver Stains from Negatives.

Iodine	5 grains.
Potassium iodide	20 "
Water	½ ounce.

When the iodine is dissolved add, while stirring, a few drops of a strong solution of hypo until solution becomes colorless. Apply to the spot with the soft end of a finger or a tuft of absorbent cotton, rubbing gently. Rinse well and dry.

Soaking Solution for Films.

BLAIR.

Alcohol	4 ounces.
Glycerine	½ ounce.
Water	16 ounces.

EASTMAN.

Water	32 ounces.
Glycerine	1 ounce.

To Strip Film from Ordinary Plates.

Give negative two coats of 2 per cent. collodion. The following formula yields good results.

Negative cotton	30 grains or 2 grams.
Ether	1 ounce, 6 dr. or 50 cc.
Alcohol	1 " 6 " or 50 cc.

Allow the first coat to dry before applying the second, and when second coating has set, place immediately in cold water until greasiness has disappeared, then place in a bath of

Sodium fluoride (com.)	5 drams or 20 grams.
Water	5 ounces or 160 cc.

When thoroughly saturated with this solution, which will take at least an hour, place without washing in

Water	7 ounces or 196 cc.
Sulphuric acid	1 dram or 4 cc.

Rubber trays should be used for this and the fluoride bath. When film begins to loosen, lay a piece of writing paper or celluloid upon it as a support, and separate the two from the glass. After washing well under tap it can be transferred to a permanent support.

The following will answer the purpose: Coat a clean glass plate which has been rubbed with French chalk and dusted, with

Gelatine	$2\frac{1}{2}$ ounces or	75 grams.
Water	16 " or	500 cc.
Glycerine	3 drams or	10 cc.

Filter before coating through canton flannel and avoid air bubbles. Coat on a leveling stand as thick as the plate will hold, allow to set and dry.

Clearing Solution to Remove Yellow Stain Caused by Developer.

Sulphate of iron	3 ounces or	90 grams.
Sulphuric acid	1 ounce or	30 cc.
Alum	1 " or	30 grams.
Water	20 ounces or	600 cc.

First well wash to remove all hypo from negative, then immerse in the above solution until the stain is removed; again wash well and dry.

Clearing Solution.

Water	20 ounces.
Powdered alum	60 grains.
Sulphuric acid	60 minims.

A Substitute for Varnishing.

Alum	2 ounces.
Tannic acid	1 dram.
Water	16 ounces.

Immerse negative for from three to five minutes; too long an immersion will loosen the film. Films so treated are almost waterproof.

Varnish for Celluloid Films.

Powdered amber	5 parts.
Chloroform	45 "
Coal-tar benzine	45 "
Gum dammar	$7\frac{1}{2}$ "

The mixture should be allowed to stand in a warm place for some time and should be decanted twice before using.

Ground-Glass Varnish.

Sandarac	90 grains.
Mastic	20 "
Ether	2 ounces.
Benzole	½ to 1½ "

The proportion of the benzole added determines the nature of the matt obtained.

Retouching Varnishes.

Sandarac	1 ounce.
Castor oil	80 grains.
Alcohol	6 ounces.

First dissolve the sandarac in the alcohol, and then add the oil.

Copaivic acid	¼ gram.
Dammar	½ "
Ether (strongest)	50 cc.
Gasoline	120 cc.

Dry the dammar by heating until melted. When quite cold, powder, and dissolve in the ether. Then add the copaivic acid and finally add the mixture to the gasoline.

Gum dammar	1 part.
Oil of turpentine	5 parts.

Strong solution of gum myrrh in oil of turpentine.

Negative Varnishes.

Sandarac	4 ounces.
Alcohol	28 "
Oil of lavender	3 "

Bleached shellac	$1\frac{1}{4}$ ounces.
Mastic	$\frac{1}{4}$ ounce.
Oil of turpentine	$\frac{1}{4}$ "
Sandarac	$1\frac{1}{4}$ ounces.
Alcohol	20 fluid ounces.

Silvering Mirrors.

The glass plate to be silvered must be absolutely clean.

A.	Silver nitrate	175 grains.
	Distilled water	10 ounces.
B.	Nitrate of ammonium	262 grains.
	Distilled water	10 ounces.
C.	Pure caustic potash	1 ounce (avoir.).
	Distilled water	10 ounces.
D.	Pure sugar candy	$\frac{1}{2}$ ounce.
	Distilled water	5 ounces.

Dissolve and add

Tartaric acid	50 grains.

Boil in a flask for ten minutes, and, when cool, add

Alcohol	1 ounce.
Distilled water to make	10 ounces.

For use, take equal parts of A and B. Mix together also equal parts of C and D, and mix in another graduate. Then mix both together in the silvering vessel and suspend the mirror face down in the solution.

Coloring Photographs.

The finely-powdered colors are mixed with the following:

Filtered albumen	100 cc.
Ammonium carbonate	5 grains.
Glycerine	3 cc.
Liquid ammonia	4 cc.
Water	25 cc.

Black for Woodwork.

Shellac.. 40 parts.
Borax.. 20 "
Glycerine .... 20 "
Water ....500 "

After dissolving, add 50 parts aniline black.

For Writing on Glass.

Bleached shellac..................................2 parts.
Venice turpentine.................................1 part.
Oil of turpentine.................................3 parts.
Lampblack...1 part.

Warm the first three ingredients together over a water-bath, and then stir in the lampblack, incorporating thoroughly.

Printing on Silk.

Wash the silk in warm water and float for two minutes on the following solution :

Salt..10 grains.
Ammonium chloride.................................10 "
Water.. 1 ounce.
Ammonia ....15 drops.

Then hang the silk up to dry. Sensitize in

Silver nitrate...................................150 grains.
Water... 1 ounce.

After floating on this for two minutes, dry, print deeply, and tone in ordinary manner.

Test for Hypo in Wash Water.

Permanganate of potash .... 3 grains.
Caustic soda.....................................15 "
Water ....16 ounces.

A few drops of the water to be tested are mixed with a few drops of this solution. If hypo is present, the red color will change to green.

A Flower Girl.

Photograph by GEO. B. SPERRY.
Engraved by
R. J. MCFEE & CO.,
Cincinnati, O.

Varnish for Plate Holders and Camera Interiors.

Bleached shellac	5 ounces.
Borax	1 ounce.
Water	20 ounces.

Digest at nearly boiling point until dissolved; filter through muslin.

Shellac	4 ounces.
Borax	1 ounce.
Water	20 ounces.
Glycerine	½ ounce.
Aniline black	2 ounces.

Comparative Strength of Various Lights.

Gas flame	1
Oxy-hydrogen light	11
Magnesium ribbon	58
Diffused daylight	268
Electric light	5179
Sunlight	16079

Color Screen.

Saturated alcoholic solution of "brilliant yellow"	4 ounces.
Pyroxyline	40 grains.
Ether	4 ounces.

Process Formulas.

Collodion.

Alcohol	8 ounces.
Ether	10 "
Cadmium iodide	52 grains.
Ammonium iodide	32 "
Strontium chloride	10 "
Calcium chloride	10 "
E. A. red label cotton	80 "

Developer.

Protosulphate of iron solution ....hydrometer test 20.
Acetic acid ....1 ounce to 16 ounces of iron solution.
Alcohol.............sufficient to make developer flow smoothly.

Intensifier.

Copper sulphate	1 ounce.
Potassium bromide	¼ "
Water	16 ounces.

Clearing solution, nitric acid 1, to 10 water. Blacken with silver nitrate solution, hydrometer 20.

COPYING COLLODION.

For Line Work.

Ether and alcohol, equal parts.

Anthony's snowy cotton	6 grains to 1 ounce.
Brown iodide of ammonium	4 " " "
Bromide of cadmium	1 " " "

ENAMEL SOLUTIONS.

Clarified fish glue	1 ounce.
Pure gum arabic	1 "
Albumen	1 "
White rock candy	¼ "
Ammonium bichromate	⅛ "
Aqua ammonia	20 drops.
Water	6 ounces.

No. 1.

Le Page's glue	3 ounces.
Albumen	1 ounce.
Water	4 ounces.
Ammonium bichromate	80 grains.

No. 2.

Gum acacia	½ ounce.
Water	8 ounces.
Aqua ammonia	¼ ounce.

No. 2 solution will keep; No. 1 will not. For use, mix 3 ounces of No. 1 with 1 ounce of No. 2.

Fish glue	2 ounces.
White of egg	1 ounce.
Ammonium bichromate	60 grains.
Chromic acid	10 "
Liquid ammonia	¼ ounce.
Water	2 ounces.

Fish glue (Le Page's clarified)	1 ounce.
White of egg	1 "
Ammonium bichromate	30 grains.
Water	1 ounce.

Etching Solution.

Saturated solution common alum	40 ounces.
Nitric acid	1 ounce.

FOR ETCHING ON STEEL.

Spencer Acid.

No. 1.

Nitric acid	5 ounces.
Water (distilled)	5 "
Pure metallic silver	1 ounce.

No. 2.

Nitric acid, C. P.	5 ounces.
Water (distilled)	5 "
Quicksilver	1 ounce.

The two solutions are made in separate vessels, and then mixed and kept in a glass-stoppered bottle. This mordant can be diluted with water, and thus the intensity of its action can be regulated. A strip of zinc, bent so as to touch a bared portion of the steel at one end and the Spencer acid at the other, is used to establish a galvanic action and start the action of the acid.

ARTOTYPE FORMULAS.

Coat clean glass with

Albumen	150 grams.
Potassium bichromate	3 "

Dry in oven at 110 degrees Fahr. Lay face down on black velvet and expose to light until albumen is insoluble. Coat with following:

Gelatine (soft)	160 grams.
Ammonium bichromate	30 "
Water	2400 cc.

Dry again at 110 degrees Fahr., and coat with:

A.

Gelatine	75 grams.
Water	1000 cc.

B.

Isinglass	75 grams.
Ammonium bichromate	18 "
Water	1000 cc.

C.

Chrome alum	10 grams.
Potassium bicarbonate	2 "
Water	2000 cc.

Mix A and B and to each 100 cc. add 2 cc. of C. Dry the plate as before. Expose in shade under negative for ten minutes. Immerse in water until colorless, wipe off with sponge and print in a lithographic press.

A Substitute for Asphaltum.

Gum turmeric has been suggested as a substitute for asphaltum, the following being the formula:

Chinese turmeric	10 parts.
Alcohol	100 "
Oil of lavender	5 "
Methyl violet, saturated solution in alcohol	2 "

DEVELOPER FOR "CLIMAX" PROCESS PLATES.

The following formula is an old and well-tried one with these plates, and will be found to give, with properly exposed plates, negatives that are of such character as to be ready for use without intensification:

No. 1.

Sulphite of soda	4 ounces.
Pyro	1 ounce.
Sulphuric acid	15 drops.
Water	20 ounces.

No. 2.

Carbonate of soda (gran.)	4 ounces.
Water	20 "

In order to get density, a smaller proportion of alkali is used, and the mixture we have found to answer best for line negatives is No. 1, 1 ounce; No. 2, ½ ounce; water 1½ ounces, and ½ of a dram of a 12-grains-to-the-ounce solution of potassium bromide. The image should develop slowly, and should be under control. However, the plate will not fog under any circumstances in this developer.

After development, wash in water, and fix in the usual solution of hyposulphite of soda. If the developer is used repeatedly, it will be found necessary to clear the plates with a mixture of hydrochloric acid, ½ ounce; water, 20 ounces. For half-tone work the prism is almost universally used, thus dispensing with the stripping of the film. The addition of the prism increases the exposure about ten to fifteen seconds, but, when one remembers that the stripping of the film is dispensed with, this is by no means an obstacle.

CARBUTT'S DEVELOPER FOR PROCESS PLATES.

Developing Formula for Half-Tone (Screen) and Negatives of Pen Drawings.

No. 1.

Neutral oxalate of potash	1 pound.
Warm water (free from lime salts)	48 ounces.

Add of a strong solution of citric acid enough to just turn litmus paper red.

No. 2.

Sulphate of iron	½ pound.
Sulphuric acid	15 drops.
Warm water	24 ounces.

No. 3—*Restrainer.*

Potassium bromide	½ ounce.
Water	10 ounces.

To develop, to 5 ounces No. 1 add 1 ounce No. 2 and 10 drops No. 3.

To get an even developed plate, use sufficient developer to well cover the plate, allow to act until, on looking through, the image appears quite dense; then wash and place in clearing bath one or two minutes.

No. 4—*Clearing Bath.*

Alum	1 ounce.
Citric acid	½ "
Water	20 ounces.

Again wash and immerse in fixing bath.

No. 5—*Fixing Bath.*

Sulphite of soda	2 ounces.
Water	6 "
Sulphuric acid	1 dram.
Water	2 drams.
Hyposulphite of soda	1 pound.
Water	48 ounces.

Chrome alum	1 ounce.
Water	8 ounces.

Dissolve in the order given, add the solution of sulphuric acid to the sulphite of soda, add this to the hyposulphite, and finally add the solution of chrome alum.

No. 6—*Reducing Solution.*

Ferricyanide of potassium	50 grains.
Water	10 ounces.

No. 7—*Bleaching Solution.*

No. 1.

Bichloride of mercury	240 grains.
Chloride of ammonium	240 "
Distilled water	20 ounces.

No. 2.

Chloride of ammonium	240 grains.
Water	20 ounces.

No. 8—*Cyanide Silver Solution.*

Cyanide of potassium, C. P.	60 grains.
Distilled water	6 ounces.
Nitrate of silver	60 grains.
Distilled water	2 ounces.

Pour the silver into the cyanide solution while stirring, and mark bottle "Poison."

Line Drawings from Photographs.

Sensitize Clemon's matt salted paper with a 40-grain-to-the-ounce bath of silver nitrate. Print under negative and fix in hypo bath, 1 : 6. Wash well, mount, and draw on the print with waterproof India ink. Bleach out the photographic image with

Water	5 ounces.
Bichloride of mercury	1 ounce.

To Clean Glass.

Make up the following mixture:

Powdered pumice stone	1 ounce.
Powdered chalk	1½ ounces.
Ammonia	½ ounce.
Water	1 "

Apply with a piece of wash leather, and polish with a piece of rag or soft paper.

Lemercier Lithographic Drawing Ink.

Yellow wax	4 parts.
Tallow (mutton)	4 "
Marseilles soap	12 "
Shellac	6 "
Lampblack	1 part.

Boil together. Grind, when cold, with water. It should flow like writing-ink from the pen.

Amateur Photographic Societies.

UNITED STATES.

AGASSIZ ASSOCIATION, MANHATTAN CHAPTER.—Organized 1881. Incorporated 1886. Headquarters, 141 East 40th Street, New York. Annual meeting, first regular meeting in January. *President*, C. F. Groth; *Vice-President*, C. Kromm; *Treasurer*, W. S. Miller; *Secretary*, E. B. Miller, 141 East 40th Street, New York City.

ALBANY CAMERA CLUB.—Organized 1887. Headquarters, 72 Chapel Street, Albany, N. Y. Annual meeting, first Friday in April. *President*, W. W. Byington; *Vice-President*, W. H. Stillman; *Treasurer*, Edward D. Mix; *Secretary*, Chas. B. Tillinghast.

AMATEUR PHOTOGRAPHIC ASSOCIATION.—Organized 1887. Headquarters Selma, Ala. Annual meeting, first Thursday in January. *President*, William S. Monk; *Treasurer* and *Secretary*, S. Orlando Trippe, Selma, Dallas Co., Ala.

AMERICAN INSTITUTE, N. Y.—(Photographic Section). Established 1859. Headquarters, Institute Rooms, 113 West 38th Street, New York. Annual meeting, February. *President*, Oscar G. Mason, Photographic Department, Bellevue Hospital, New York; *Vice-President*, R. A. B. Dayton; *Treasurer*, Wm. Dean; *Secretary*, J. W. Bartlett, M.D., 149 West 94th Street, New York.

AMERICAN LANTERN SLIDE INTERCHANGE.—Organized 1885. *General Manager*, F. C. Beach, 361 Broadway, New York. *Assistant Managers*, W. H. Rau, 1324 Chestnut Street, Philadelphia, Pa.; Will H. Olmstead, Syracuse, New York; W. H. Cheney, Orange, N. J., and John W. Paterson, Albany, N. Y.

BETHLEHEM PHOTOGRAPHIC SOCIETY.—Organized 1894. Headquarters, meets at members' houses. Annual meeting, third Tuesday in January. *President*, Prof. E. M. Hyde; *Vice-President*, M. A. Richards; *Treasurer*, C. F. Smith; *Secretary*, F. E. Hammann, Bethlehem, Pa.

BOSTON CAMERA CLUB.—Organized 1881. Headquarters, 50 Bromfield Street, Boston, Mass. Annual meeting, first Monday in January. *President*, George M. Morgan; *Vice-Presidents*, Joseph Prince Loud, Charles Sprague and Wm. Q. Witherell; *Treasurer*, Charles H. Chandler; *Secretary*, Charles Hall Perry; *Librarian*, Albert E. Schaaf.

BROOKLYN ACADEMY OF PHOTOGRAPHY.—Incorporated 1887. Headquarters 177 Montague Street, Brooklyn, N. Y. Annual meeting, first Monday in June. *President*, August A. Goubert; *Vice-Presidents*, Wm. Dudley and Samuel Baron; *Treasurer*, Wm. T. Wintringham; *Recording Secretary*, Wm. Arnold; *Corresponding Secretary*, H. B. Fullerton.

BUCKEYE CAMERA CLUB.—Headquarters, Bronson Building, Columbus, Ohio. Annual meeting, third Thursday in December. *President*, Charles Doty; *Vice-President*, Prof. Jos. N. Bradford; *Treasurer* and *Secretary*, John Field.

BUFFALO CAMERA CLUB.—Organized 1888. Headquarters, Market Arcade, Main Street, Buffalo, N. Y. Annual meeting, October. *President*, William J. Haskell; *Vice-President*, John A. Stein; *Treasurer* and *Secretary*, John B. Zenner; *Interchange Director*, H. H. Boyce.

CAMERA CLUB, THE.—Formed by the affiliation of the Society of Amateur Photographers of New York and The New York Camera Club. Headquarters, 113-115 West 38th Street, New York. Annual meeting, second Tuesday in April. *President*, Dexter H. Walker; *Vice-President*, William D. Murphy; *Treasurer*, Camille C. Roumage; *Secretary*, Charles W. Canfield.

CAMERA CLUB OF MT. VERNON.—Established 1895. Meetings held once a month at members' houses. *President*, B. H. Carmer; *Vice-President*, Edgar Henriques; *Treasurer*, S. W. Nourse; *Secretary*, Miss Mary E. Jennings, 512 South First Avenue, Mt. Vernon, N.Y.

CAMERA CLUB OF THE C. BI. C.—Organized 1891. Headquarters, 409 Fifteenth Street, N. W., Washington, D. C. Annual meeting, October. *President*, Charles Richards Dodge; *Treasurer* and *Secretary*, Eugene Lee Ferguson.

"CAMERADS."—Established 1886. Headquarters, Rutgers College, New Brunswick, N. J. *President*, Professor PeterT. Austin; *Vice-President*, Wm. D. Horn; *Treasurer*, Charles V. Myers; *Secretary*, Dr. Harvey Iredell, Box 34, New Brunswick, N. J.

CAPITAL CAMERA CLUB.—Organized 1891. Headquarters 401 Seventh Street, N. W., Washington, D. C. *President*, Dr. Robert Reyburn; *Vice-President*, Geo. W. White; *Treasurer*, Wm. P. Herbst; *Secretary*, Joseph L. Shaw.

CENTRAL CAMERA CLUB, BROOKLYN Y. M. C. A.—Established 1888. Headquarters, 502 Fulton Street, Brooklyn, N. Y. *President*, Wm. H. Lowery; *Vice-President*, A. H. Longstreet; *Treasurer*, J. G. McTaggart; *Secretary*, Percy Lathrop.

CHICAGO SOCIETY OF AMATEUR PHOTOGRAPHERS. — Organized 1886; reorganized 1894. Headquarters, 4 East Monroe Street, Chicago, Ill. Annual meeting, fourth Thursday in January. *President*, W. A. Morse; *Vice-President*, W. R. Wilson; *Treasurer*, Marshall Waite; *Secretary*, F. F. Gaylord.

CLEVELAND CAMERA CLUB.—Established 1887. Headquarters, 136 Ontario Street, Room 6, Cleveland, O. Annual meeting, third Monday in December. *President*, Wm. Ogier; *Vice-President*, Chas. Potter; *Treasurer*, Will Dorn; *Secretary*, R. Dayton, M.D.; *Custodian*, Frank Dorn.

COLORADO CAMERA CLUB.—Organized 1892. Headquarters, Camera Club Block, 329 16th Street, Denver, Colo. Annual meeting, third Thursday in December. *President*, W. H. Jackson; *Vice-President*, H. H. Buckwalter; *Treasurer*, H. D. Smith; *Secretary*, A. D. Gilleland.

COLUMBIA CAMERA CLUB.—Organized 1893. Headquarters, Astoria, Oregon. Annual meeting, second Wednesday in November. *President*, W. A. Sherman; *Vice-President*, Nelson Troyer; *Treasurer*, G. W. Lounsberry; *Secretary*, William Timson.

COLUMBIA PHOTOGRAPHIC SOCIETY.—Incorporated 1893. Headquarters, 1507 Columbia Ave., Philadelphia, Pa. Annual meeting, first Monday in February. *President*, Dr. G. J. R. Miller; *Vice-President*, W. P. Buchanan; *Secretary* and *Treasurer*, John N. Reeve, 203 Walnut Place, Room 4, Philadelphia, Pa.

COLUMBIAN AMATEUR PHOTOGRAPHIC EXCHANGE.—Established 1893. *President*, J. T. Harden, Beatrice, Neb.; *Treasurer* and *Secretary*, A. H. Waite, 910 C. Street, Tacoma, Wash. This society is limited to fifteen members who are located in various states. Views are exchanged quarterly, and the entire working of the society is transacted by correspondence.

CORLISS ART AND CAMERA CLUB.—Headquarters at Newburyport, Mass. *President*, John H. Wheeler; *Vice-President*, Lewis H. Tappan; *Treasurer* and *Secretary*, M. R. Currier; *Corresponding Secretary*, O. P. Gould.

CORTLAND CAMERA CLUB.—Organized 1895. Headquarters, Y. M. C. A., Cortland, N. Y. Annual meeting, first meeting in January. *President*, F. W. Higgins; *Vice-President*, J. G. Jarvis; *Treasurer* and *Secretary*, L. M. Alexander. Box 213, Cortland, N. Y.

DAGUERRE CAMERA CLUB.—Organized 1895. *Secretary*, J. W. Flynn, M.D., 116 East 81st Street, New York.

ILLINOIS COLLEGE OF PHOTOGRAPHY.—Established 1895. Headquarters, Effingham, Ill. *President*, L. H. Bissell; *Vice-President*, W. B. Dennis, Sr.; *Treasurer*, Dr. H. C. Eversman; *Secretary*, Joseph Hickman.

INTERNATIONAL PHOTO PRINT EXCHANGE.—Formed 1893. Postal Society. *Secretary*, Walter Sprange, Beach Bluff, Mass.

LAWRENCE CAMERA CLUB.—Established 1893. Has dissolved.

LOWELL CAMERA CLUB.—Established 1889. Incorporated 1892. Headquarters, Central Block, Lowell, Mass. Annual meeting, first Tuesday in March. *President*, Paul Butler; *Vice-President*, Wm. P. Atwood; *Treasurer*, M. A. Taylor; *Secretary*, George A. Nelson.

MATTAPAN CAMERA CLUB.—Organized, May, 1890. Headquarters, Brush Hill Road, Milton, Mass. Annual meeting, May. *President*, John A. Locklin; *Vice-President*, Walter Hertzberg; *Treasurer*, Henry N. Locklin; *Secretary*, Erdman Sonnenbrodt.

MIDDLETOWN (CONN.) SCIENTIFIC ASSOCIATION.—The camera section of this association has ceased to exist.

MINNEAPOLIS CAMERA CLUB.—Incorporated 1892. Headquarters, 13 North Fourth Street, Minneapolis. Minn. Annual meeting, April. *President*, W. B. Augir; *Vice-President*, W. H. McMullen; *Treasurer*, A. S. Williams; *Secretary*, C. J. Hibbard, 17 South Fourth Street, Minneapolis, Minn.

MYSTIC CAMERA CLUB.—Established, 1889. Incorporated 1891. Headquarters, 202 High Street, Medford, Mass. Annual meeting, first Tuesday in January. *President*, Chas. A. Smith; *Vice-President*, Warren M. Archibald; *Treasurer*, Jos. B. Thaxter, Jr.; *Secretary*, Chas. A. Staniford.

NEWARK CAMERA CLUB.—Organized 1888. Headquarters, 226 Market Street, Newark, N. J. Annual meeting, second Monday in April. *President*, P. L. V. Thiery; *Vice-President*, W. A. Halsey; *Treasurer*, J. M. Foote; *Secretary* D. S. Plumb.

NEW BRITAIN CAMERA CLUB.—Established 1892. Headquarters, 210 Main Street, New Britain, Conn. Annual meeting, second Tuesday in June. *President*, E. T. Porter; *Vice-President*, G. A. Reckard; *Treasurer* and *Secretary*, F. B. Wood.

NEW ENGLAND LANTERN SLIDE EXCHANGE.—*Treasurer* and *Secretary*, Will. C. Eddy, 3 Gove Street, Medford, Mass.

OLD COLONY CAMERA CLUB.—Headquarters, Smith Block, Liberty Street, Rockland, Mass. Annual meeting, first Saturday in January. *President*, David Smith; *Vice-President*, E. H. Jenkins; *Treasurer*, E. H. Jenkins; *Secretary*, David Smith.

ONEIDA CAMERA CLUB.—Established 1894. Headquarters, P. O. Block, Oneida, N. Y. Annual meeting, March. *President*, B. S. Teale; *Vice-President*, G. R. Hanson; *Treasurer*, Albert Dygert; *Secretary*, E. R. McDougall.

ORANGE CAMERA CLUB.—Organized 1892. Headquarters, 222 Main Street, Orange, N. J. Annual meeting, March 20th. *President*, Wm. F. D. Crane; *Vice-President*, Wm. T. Baird; *Treasurer*, D. S. Plumb; *Secretary*, W. Hermann Apgar.

OREGON CAMERA CLUB.—Organized 1892. Headquarters, Oregonian Building, Portland, Ore. Annual meeting, second Tuesday in January. *President*, Edgar Felloes; *Vice-President*, Dr. J. Clifford Perry; *Treasurer*, F. A. Jackson; *Secretary*, Milton P. Goldsmith.

PITTSFIELD CAMERA CLUB.—Established 1892. Headquarters, Rooms of Berkshire Electric Co., Pittsfield, Mass. Annual meeting, first Monday in February. *President*, Clarence G. Tompkins; *Vice-President*, R. B. Johnson; *Treasurer* and *Secretary*, Joseph E. Colton.

PORTLAND CAMERA CLUB.—Organized 1890. Headquarters, Society of Art Building, Portland, Me. *President*, Dr. Scott Gilson; *Vice-President*, F. W. Woodman; *Treasurer*, Clayton Whipple; *Secretary*, F. H. Collins; *Librarian*, J. H. Lamson.

POSTAL PHOTOGRAPHIC CLUB.—Organized 1888. *President*, Wilfred A. French, Boston, Mass.; *Treasurer* and *Secretary*, F. E. Fairbanks, Fitchburg, Mass.

PROVIDENCE CAMERA CLUB.—Established 1883. Headquarters, 87 Weybosset Street, Providence, R. I. Annual meeting, first Tuesday in June. *President*, R. Clinton Fuller; *Vice-President*, W. Penn Mather; *Treasurer*, Edmund A. Darling; *Recording Secretary*, Fred. P. Wilbur; *Corresponding Secretary*, J. Eliot Davison.

PUTNAM CAMERA CLUB.—Established 1888. Annual meeting, first Monday in June. *President*, Geo. E. Dresser; *Vice-President*, Edgar Clark; *Treasurer*, E. F. Whitmore; *Secretary*, Eric H. Johnson.

SCHUYLKILL CAMERA CLUB.—Established 1889. Headquarters, Sheafer Office Building, Pottsville, Pa. Annual meeting, May. *President*, A. W. Sheafer; *Vice-President*, Miss Elena Roads; *Treasurer*, W. L. Sheafer; *Secretary*, B. S. Simonds.

SEATTLE CAMERA CLUB.—Organized 1895. *Secretary*, Emil de Neuf, Seattle, Wash.

SILVER LAKE ASSEMBLY CAMERA CLUB.—Established 1895. Headquarters and place of annual meeting, Silver Lake Assembly, New York. *President*, John W. Sanborn, Smethport, Pa.; *Secretary* and *Treasurer*, Uri Mulford, Tioga, Pa.

SPRINGFIELD CAMERA CLUB.—Organized 1886. Headquarters, Y. M. C. A. Building, Springfield, Mass. Annual meeting, third Wednesday in October. *President*, Wm. B. Sleigh; *Secretary*, Bion D. Wheeler, Box 1267, Springfield, Mass.

ST. LOUIS PHOTOGRAPHIC SOCIETY.—Headquarters, Y. M. C. A. Building, Grand Avenue and Franklin Street, St. Louis, Mo. Annual meeting, first Tuesday in December. *President*, Robert E. M. Bain; *Vice-President*, John W. Dunn; *Treasurer* and *Secretary* John D. Elliott.

ST. PAUL CAMERA CLUB.—Organized 1893. Headquarters, St. Paul Fire and Marine Insurance Building, St. Paul, Minn. Annual meeting, first Tuesday in March. *President*, James Paris; *Vice-President*, D. T. Brown; *Treasurer*, W. B. Thorne; *Secretary*, W. J. Sonnen.

SUNNY SIDE CAMERA CLUB.—Organized 1891. Headquarters, 5900 South Broadway, St. Louis, Mo. Annual meeting, October 10th. *President*, Judge B. W. Blumenthal; *Vice-President*, Edward Brock; *Treasurer* and *Secretary*, Professor Wm. A. Britchner.

SYRACUSE CAMERA CLUB.—Organized 1886. Incorporated 1892. Headquarters, 322 South Salina Street, Syracuse, N. Y. Annual meeting, first Friday in January. *President*, Herbert F. Smith; *Vice-President*, Geo. Timmins; *Treasurer*, Leroy Eldredge; *Secretary*, Fred. Fields.

"TECH" CAMERA CLUB.—Established 1889. Headquarters, Worcester Polytechnic Institute, Boynton Hall, Worcester, Mass. Annual meeting, September. *President*, John W. Higgins; *Vice-President*, Everett Darling; *Treasurer* and *Secretary*, James B. Rood.

TECHNOLOGY PHOTOGRAPHIC SOCIETY.—Headquarters, Massachusetts Institute of Technology, Boyleston Street, Boston, Mass. "Society practically defunct."

TOPEKA CAMERA CLUB.—Organized 1894. Headquarters, Crawford Building, Topeka, Kansas. Annual meeting, first Tuesday in January. *President*, W. C. F. Reichenbach; *Vice-President*, F. G. Willard; *Treasurer*, W. E. Culver; *Secretary*, F. M. Tuckerman.

WATERBURY, THE PHOTOGRAPHIC SOCIETY OF.—Organized 1888. Headquarters, Odd Fellows' Block, Waterbury, Conn. Annual meeting, first Tuesday in April. *President*, Leroy S. White; *Vice-President*, Geo. H. Bario; *Treasurer*, Wm. Hodges; *Secretary*, Wilbur M. Bryant.

WORCESTER (MASS.) CAMERA CLUB.—Organized 1892. Disbanded.

YOUNG LADIES' CAMERA CLUB.—Established 1895. Headquarters, 80 Nicollet Avenue, Minneapolis, Minn. Annual meeting, first Wednesday in June, *President*, Miss Mabel Jameson; *Vice-President*, Miss Bell Jeffery; *Treasurer* Miss Minerva Turnbull; *Secretary*, Miss M. Eva McIntyre.

CANADA.

HALIFAX CAMERA CLUB.—Organized 1896. *President*, W. A. Henry; *Vice-Presidents*, E. A. Wilson and G. A. Garvin; *Treasurer*, B. P. Saunders; *Secretary*, C. E. W. Dodwell, Halifax, N. S.

MONTREAL CAMERA CLUB.—Established 1890. Incorporated 1892. Headquarters, 4 Phillips Square, Montreal, P. Q., Canada. Annual meeting, first Tuesday in May. *President*, E. Stranger; *Vice-President*, Charles Lester; *Treasurer*, A. C. Lyman; *Secretary*, Alfred W. Cole, 28 Victoria Street, Montreal, P. Q., Canada.

QUEBEC CAMERA CLUB.—Organized 1893. Ceased to exist, May, 1896.

ST. JOHN CAMERA CLUB.—Organized 1893. Headquarters, 65 Prince William Street, St. John, N. B., Canada. Annual meeting, third Monday in April. *President*, George A. Henderson; *Vice-President*, D. L. Hutchinson; *Treasurer*, J. R. Woodburn; *Secretary*, J. Kaye-Allison, Box 401, St. John, N. B., Canada.

TORONTO CAMERA CLUB.—Organized 1887. Incorporated 1893. Headquarters, Forum Building, cor. Yonge and Gerrard Streets, Toronto, Canada. Annual meeting, first Monday in November. *President*, E. E. King, M.D.; *1st Vice-President*, A. W. Croil; *2nd Vice-President*, W. B. Varley; *Treasurer* and *Secretary* Ernest W. Lake, 14 King Street West, Toronto, Can.

ENGLAND.

ACCRINGTON AND DISTRICT CAMERA CLUB.—*Secretary*, I. Hanson, Rothwell Heights, Accrington, England.

AINTREE AND DISTRICT SOCIETY OF PHOTOGRAPHERS AND LANTERNISTS.—*Secretary*, D. J. Neil, 8 Chelsea Road, Aintree, Liverpool, England.

ASHTON-UNDER-LYNE PHOTOGRAPHIC SOCIETY.—*Secretary*, R. T. Morsland, 24 Park Parade, Ashton-under-Lyne, England.

AYLESBURY AMATEUR PHOTOGRAPHIC SOCIETY.—*Secretary*, J. F. Roche, 2 St. Mary's Sq., Aylesbury, Bucks, England.

BANBURY AND DISTRICT PHOTOGRAPHIC SOCIETY.—*Secretary*, Jno. Davenport, Brookfield, Banbury, Oxford, England.

BARNSLEY DISTRICT PHOTOGRAPHIC SOCIETY.—*Secretary*, C. R. Barham, 9 Corporation Street, Barnsley, England.

NATURALISTS' FIELD CLUB.—*Secretary*, Jno. Carless, 27 Shakespeare Street, Barrow-in-Furness, England.

BATH PHOTOGRAPHIC SOCIETY.—*Secretary*, W. M. Ashman, 12a Old Bond Street, Bath, England.

BATLEY AND DISTRICT PHOTOGRAPHIC SOCIETY.—*Secretary*, A. S. Fox, Springfield Villa, Batley, Yorks, England.

BEVERLY PHOTOGRAPHIC AND SKETCHING SOCIETY.—*Secretary* T. J. Marley, Toll Gavel, Beverly, Yorks, England.

WEST KENT AMATEUR PHOTOGRAPHIC SOCIETY.—*Secretary*, E. Hawkins, Manor Estate, Sidcup, Kent, England.

BIRMINGHAM PHOTOGRAPHIC SOCIETY.—*Secretary*, C. J. Fowler, Court Mount, Erdington, Birmingham, England.

PHOTOGRAPHIC SURVEY COUNCIL OF WARWICKSHIRE.—*Secretary*, J. H. Pickard, Southfield, Priory Road, Edgbaston, Birmingham, England.

TALBOT CIRCULATING PHOTO ALBUM CLUB.—*Secretary*, F. H. Davies, 265 Coventry Road, Birmingham, England.

BOLTON PHOTOGRAPHIC SOCIETY.—*Secretary*, J. H. Heyes, Deansgate, Bolton, Lancaster, England.

BOOTLE PHOTOGRAPHIC SOCIETY.—*Secretary*, F. W. Knowles, 311 Stanley Road, Liverpool, England.

BOSTON CAMERA CLUB.—*Secretary*, A. H. Smith, Lindum House, Boston, Lincolnshire, England.

BOURNEMOUTH SCIENTIFIC AND ANTIQUARIAN SOCIETY.—*Secretary*, E. Greenleaves, Priory Mansions, Bath Road, Bournemouth, England.

GORDON CAMERA CLUB.—*Secretary*, W. Clark, Coggeshall Road, Braintree, Essex, England.

BRIGHOUSE PHOTOGRAPHIC SOCIETY.—*Secretary*, J. H. Georgeson, Huddersfield Road, Brighouse, York, England.

BRIGHTON AND SUSSEX N. H. AND PHIL. SOCIETY.—*Secretary* R. C. Ryan, 43 Compton Avenue, Brighton, England.

BRISTOL AND W. OF ENGLAND AMATEUR PHOTO. ASSOCIATION.—*Secretary*, Edw. Brightman, Redland Road, Bristol, England.

LIGHT AND TRUTH POSTAL PHOTOGRAPHIC SOCIETY.—*Secretary*, H. E. Trew, 139 Cheltenham Road, Bristol, England.

BROMSGROVE PHOTO. SOCIETY.—*Secretary*, H. E. Holmes, The School, Bromsgrove, England.

ST. JOHN'S PHOTO. AND SCIENTIFIC SOCIETY.—*Secretary*, Cyril B. Jones, The Vicarage, Brooklands, Manchester, England.

BURNLEY PHOTO. SOCIETY.—*Secretary*, Jesse L. Altham, Bank Chambers, Burnley, Lancashire, England.

BURTON-ON-TRENT N. H. AND ARCH SOCIETY.—*Secretary*, R. H. Blackburn, 86, Blackpool Street, Burton-on-Trent, England.

BURY PHOTO. AND ARTS SOCIETY.—*Secretary*, Roger Wood, 10 Bolton Street, Bury, Lancashire, England.

STAFF COLLEGE PHOTO. CLUB.—*Secretary*, Capt. R. A. R. Montgomery, Staff College, Camberley, England.

CARLISLE AND COUNTY AMAT. PHOTO. SOCIETY.—*Secretary*, J. S. Atkinson, 55 S. Pettrill Street, Carlisle, England.

HALTWHISTLE AND DISTRICT PHOTO. ASSOC.—*Secretary*, David Macadam, Carlisle City and District Bank, Haltwhistle, England.

CHICHESTER PHOTO. SOCIETY.—*Secretary*, E. A. Long, 15 East Street, Chichester, Sussex, England.

CHORLEY PHOTO. AND SKETCHING CLUB.—*Secretary*, Thos. Brindle, 62 Market Street, Chorley, England.

CLECKHEATON MECHANICS' INST. PHOTO. SOCIETY.—*Secretary*, Wm. Drake, 10 Northgate, Cleckheaton, England.

COLNE CAMERA CLUB.—*Secretary*, W. W. Kirk, 16 Atkinson Street, Colne, England.

COVENTRY AND MIDLAND PHOTO. SOCIETY.—*Secretary*, A. B. Clarke, Hampton House, Coventry, England.

CYCLISTS PHOTOGRAPHIC PORTFOLIO CLUB.—*Secretary*, W. L. J. Orton, 7 Bishop Street, Coventry, England.

CREWE AMAT. PHOTO. SOCIETY.—*Secretary*, Thos. Gorrell, 106 Edleston Road, Crewe, England.

CROYDON CAMERA CLUB.—*Secretary*, H. E. Holland, 69 Lansdowne Road, Croydon, England.

CROYDON MICROSCOPICAL AND N. H. CLUB.—*Secretary*, H. D. Gower, 55 Benson Road, Croydon, England.

DARWEN AMATEUR PHOTOGRAPHIC SOCIETY.—*Secretary*, John A. Hargreaves, High Bank, Darwen, England,

DARLINGTON PHOTOGRAPHIC SOCIETY.—*Secretary*, Jno. Calvert, 64 North Road, Darlington, England.

DENTON PHOTOGRAPHIC SOCIETY.—*Secretary*, J. Edwards, 44 Herbert Street, Blackley, Manchester, England.

DERBY PHOTOGRAPHIC SOCIETY.—*Secretary*, A. H. Bennett, 137 Normonton Road, Derby, England.

DEVONPORT CAMERA CLUB.—*Secretary*, E. James Seymour, 18 S. Aubyn Street, Devonport, England.

DONCASTER MICROSCOPICAL AND GENERAL SCIENCE SOCIETY.—*Secretary*, M. H. Stiles, 2 French Gate, Doncaster, England.

DUNKINFIELD PHOTOGRAPHIC SOCIETY.—*Secretary*, W. H. Shirley, Commercial Buildings, Dunkinfield, England.

DUNSTABLE PHOTOGRAPHIC SOCIETY.—*Secretary*, Edw. Hare, The Poplars, Dunstable, England.

DURHAM CITY CAMERA CLUB.—*Secretary*, Robt. Hauxwell, The Avenue, Durham, England.

EASTBOURNE PHOTOGRAPHIC SOCIETY.—*Secretary*, J. J. Halloway, 11 Hyde Gardens, Eastbourne, England.

ERITH AMATEUR PHOTOGRAPHIC SOCIETY.—*Secretary*, Dr. Jno. Hardee, 1 Queen's Road, Erith, Kent, England.

EXETER CAMERA CLUB.—*Secretary*, W. L. Jones, 5 Clifton Hill, Exeter, England.

FAKENHAM DISTRICT CAMERA CLUB.—*Secretary*, Henry Newson, "The Square," Fakenham, England.

ROYAL CORNWALL POLYTECHNIC SOCIETY.—*Secretary*, Edw. Kitto, "The Observatory," Falmouth, England.

FAVERSHAM INSTITUTE PHOTOGRAPHIC SOCIETY.—*Secretary*, C. H. Semark, Stone Street, Faversham, England.

GLOSSOP DALE PHOTOGRAPHIC SOCIETY.—*Secretary*, T. W. Sharpe, 1 Pike's Lane, Glossop, England.

GOOLE PHOTOGRAPHIC SOCIETY.—*Secretary*, Samuel Wells, Jefferson Street, Goole, England.

GRAVESEND PHOTOGRAPHIC SOCIETY.—*Secretary*, T. L. Winnett, 5 The Grove, Gravesend, England.

CROMWELL PHOTOGRAPHIC SOCIETY.—*Secretary*, Chas. Rumbold, 4 Dene Side, Great Yarmouth, England.

GREAT YARMOUTH AMATEUR PHOTOGRAPHIC ASSOCIATION.—*Secretary*, George T. Davis, 4 Market Place, Great Yarmouth, England.

GREAT YARMOUTH CAMERA CLUB.—*Secretary*, H. H. George, The Tower, Gorleston, England.

GRIMSBY AND DISTRICT PHOTOGRAPHIC SOCIETY.—*Secretary*, A. T. Flint, 5 W. Prospect, Ainslie Street, Grimsby, England.

GUILFORD PHOTOGRAPHIC SOCIETY.—*Secretary*, A. E. Moon, 36 High Street, Guilford, England.

HALIFAX CAMERA CLUB.—*Secretary*, Arthur Priestly, 7 Commercial Street, Halifax, England.

HASTINGS AND ST. LEONARDS PHOTOGRAPHIC SOCIETY—*Secretary*, Algernon Brooker, 21A Wellington Place, Hastings, England.

HEREFORDSHIRE PHOTOGRAPHIC SOCIETY—*Secretary*, Cecil Gethen, 9 St. Nicholas Street, Hereford, England.

HOVE CAMERA CLUB.—*Secretary*, E. E. Mainwaring, 75 Lansdowne Place, Hove, England.

HOLFMIRTH AMATEUR PHOTOGRAPHIC SOCIETY.—*Secretary*, D. Bilson, Birchin House, Holfmirth, England.

HUDDERSFIELD NATURALIST AND PHOTOGRAPHIC SOCIETY. *Secretary*, A. Clarke, 9 St. Andrews Road, Huddersfield, England.

HULL PHOTOGRAPHIC SOCIETY.—*Secretary*, A. H. White, 141 Westbourne Avenue, Hull, England.

ILFORD SOCIAL CLUB.—*Secretary*, W. F. Mumford, Oakfield House, Ilford, Essex, England.

IPSWICH PHOTOGRAPHIC SOCIETY.—*Secretary*, J. C. Wiggin, 34 St. Matthews Street, Ipswich, England.

JERSEY AMATEUR PHOTOGRAPHIC SOCIETY.—*Secretary*, Col. J. W. S. Butler, 2 Queens Road, Jersey, England.

KEIGHLEY AND DISTRICT PHOTOGRAPHIC ASSOCIATION.—*Secretary*, Jno. Gill, 27 Highfield Lane, Keighley, England.

KENDAL LITERARY AND SCIENTIFIC INSTITUTION.—*Secretary*, T. N. Ritson, Helm View, Kendal, England.

KINGSBRIDGE CAMERA CLUB.—*Secretary*, R. McAll Stewart, St. Edmunds Hall, Kingsbridge, England.

KING'S LYNN PHOTOGRAPHIC SOCIETY.—*Secretary*, H. Tilson, Railway Road, King's Lynn, England.

KING'S LYNN Y. M. C. A. PHOTOGRAPHIC CLUB.—*Secretaries*, W. Lock and F. Hampton.

KINGSTON-ON-THAMES AND DISTRICT PHOTOGRAPHIC SOCIETY. —*Secretary*, Dr. Finny, Kenlis, Kingston Hill, Surrey, England.

LANCASTER PHOTOGRAPHIC SOCIETY.—*Secretary*, Wm. Briggs, 21 Cheapside, Lancaster, England.

LEAMINGTON AMATEUR PHOTOGRAPHIC SOCIETY.—*Secretary*, Signor Aspa, Priory House, Leamington, England.

LEEDS CAMERA CLUB.—*Secretary*, H. F. Wiggleworth, Primrose Cottage, Leeds, England.

LEEDS PHOTOGRAPHIC SOCIETY.—*Secretary*, Alfred Naylar, 2 Providence Terrace, Leeds, England.

LEICESTER AND LEICESTERSHIRE PHOTOGRAPHIC SOCIETY.—*Secretary*, Thos. Brown, 68 Church Gate, Leicester, England.

LEWES PHOTOGRAPHIC SOCIETY.—*Secretary*, Geo. Carpenter, 81 High Street, Lewes, England.

LINCOLN CAMERA CLUB.—*Secretary*, W. E. Asquith, 24 Altham Terrace, St. Catherines, Lincoln, England.

LIVERPOOL AMATEUR PHOTOGRAPHIC ASSOCIATION.—*Secretary*, F. A. Schierwater, Percy Buildings, Eberle Street, Liverpool, England.

LIVERPOOL CAMERA CLUB.—*Secretary*, Wm. Tansley, 14 Wentworth Street, Liverpool, England.

WALTON PHOTOGRAPHIC SOCIETY—*Secretary*, T. Bickerstaff, 79 Rawcliffe Road, Walton, Liverpool, England.

PARK PHOTOGRAPHIC SOCIETY.—*Secretary*, Alec. Mair, 12 Arthur Street, Liverpool, England.

TOXTETH PHOTOGRAPHIC SOCIETY.—*Secretary*, Henry Goldstone, 53 Alwyn Street, St. Michaels, Liverpool, England.

LIVERPOOL PHYSICAL SOCIETY.—*Secretary*, Dr. Chas. A. Kohn, University College, Liverpool, England.

Y. M. C. A. CAMERA CLUB.—*Secretary*, Edw. Sanders, 144A Brownlow Hill, Liverpool, England.

BRITISH ASSOCIATION FOR ADVANCEMENT OF SCIENCE.—*Secretary*, G. Griffith, Burlington House, W. London, England.

HELIOS POSTAL PHOTOGRAPHIC CLUB.—*Secretary*, Henry Everett, 125 St. Paul's Road, Bow, E., London, England.

PHOTOGRAPHIC CLUB.—*Secretary*, F. A. Bridge, Dalston Lane, London, N. E., England.

ST. BARTHOLOMEW'S HOSPITAL PHOTOGRAPHIC SOCIETY.—*Secretary*, M. G. Pearson, St. Bartholomew's Hospital, London, E. C., England.

FINSBURY TECHNICAL COLLEGE PHOTOGRAPHIC SOCIETY.—*Secretary*, F. R. H. Wood, Finsbury Technical College, Leonard Street, E. C., London, England.

NORTH MIDDLESEX PHOTOGRAPHIC SOCIETY.—*Secretary*, W. Taylor, 31 Palace Road, Harnsey, N., London, England.

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RECEIVED TOO LATE FOR CLASSIFICATION.

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TABLES.

TABLE OF THE ELEMENTS:

THEIR SYMBOLS, ATOMIC WEIGHTS, AND EQUIVALENTS.

	Symbol.	Atomic Weight.	Equivalent.		Symbol.	Atomic Weight.	Equivalent.
Aluminium	Al	27.02	9.007	Mercury	Hg	199 8	99.9
Antimony	Sb	120.	40.	Molybdenum	Mo	95.8	19.16
Arsenic	As	74.9	24.97	Nickel	Ni	58.6	29.3
Barium	Ba	136.8	68.4	Niobium	Nb	94.	31.33
Beryllium	Be	9.08	4.54	Nitrogen	N	14.01	4.67
Bismuth	Bi	208.	69.33	Osmium	Os	193.	24.125
Boron	B	10.9	3.66	Oxygen	O	15.96	7.98
Bromine	Br	79.75	79.75	Palladium	Pd	106.2	26.55
Cadmium	Cd	112.	56.	Phosphorus	P	30.96	10.32
Cæsium	Cs	133.	132.7	Platinum	Pt	194.3	48.575
Calcium	Ca	39.9	19.95	Potassium	K	39.04	39.04
Carbon	C	11.97	2.99	Rhodium	Ro	104.	26.
Cerium	Ce	139.9	46.6	Rubidium	Rb	85.2	85.2
Chlorine	Cl	35.37	35.37	Ruthenium	Ru	104.4	26.1
Chromium	Cr	52.4	26.2	Selenium	Se	78.8	39.4
Cobalt	Co	59.	29.5	Silicon	Si	28.3	7.
Copper	Cu	63.2	31.6	Silver	Ag	107.66	107.66
Didymium	Di	143.0	47.8	Sodium	Na	23.	23.
Erbium	E	165.9	55.3	Strontium	Sr	87.3	43.65
Fluorine	F	19.1	19.1	Sulphur	S	31.98	15.99
Gallium	Ga	69.	23.	Tantalum	Ta	182.	60.67
Gold	Au	197.	65.66	Tellurium	Te	125.	62.5
Hydrogen	H	1.	1.	Thallium	Tl	203.64	203.64
Indium	In	113.4	37.8	Thorium	Th	231.87	57.97
Iodine	I	126.53	126.53	Tin	Sn	117.8	58.9
Iridium	Ir	192.5	48.125	Titanium	Ti	48.0	12.
Iron	Fe	55.9	27.95	Tungsten	W	183.6	30.6
Lanthanum	La	138.5	46.17	Uranium	U	240.	60.
Lead	Pb	206.4	103.2	Vanadium	V	51.2	17.07
Lithium	Li	7.01	7.01	Yttrium	Y	89.6	29.87
Magnesium	Mg	24.	12.	Zinc	Zn	65.2	32.6
Manganese	Mn	55.	27.5	Zirconium	Zr	90.	45.

NOTE.—The equivalent numbers are the smallest quantities of the element that unite with one part of hydrogen, eight parts of oxygen, or thirty-five parts of chlorine.

SOLUBILITY OF CHLORIDE OF SILVER IN SOLUTIONS OF VARIOUS SALTS.

(*H. Hahn.*)

	Per Cent. of the Solution.	Saturated at	Per Cent. of Silver Chloride Dissolved.	Per Cent. of Silver.	Sp. Gr.	Temperature.	Number of Grams of Silver in 100 c. c.
Potassium chloride	24.95	19.6°	0.0776	0.0584	1.1774	19.6°	0.0688
Sodium "	25.96	"	0.1053	0.0793	1.2053	"	0.0956
Ammonium "	28.45	24.5°	0.3397	0.2551	1.0835	30.0°	0.2764
Calcium "	41.26	"	0.5713	4.4300	1.4012	"	0.6283
Magnesium "	36.35	"	0.5313	0.3999	1.3350	"	0.5339
Barium "	27.32	"	0.0570	0.0429	1.3017	"	0.0558
Ferrous "	30.70	—	0.1686	0.1269	1.4199	20.0°	0.1802
Ferric "	37.48	—	0.0058	0.0044	1.4472	21.4°	0.0064
Manganous "	43.85	24.5°	0.1996	0.1499	1.4851	20.0°	0.2226
Zinc "	53.34	—	0.0134	0.0101	1.6005	"	0.0162
Cuprous "	44.48	24.5°	0.0532	0.0399	1.5726	"	0.0627
Lead "	0.99	"	0.0000	0.0000	1.0094	"	0.0000

SOLUBILITY OF SILVER CHLORIDE IN SOLUTIONS OF SODIUM SULPHITE OF VARIOUS DEGREES OF CONCENTRATION.

(*W. de W. Abney.*)

Strength of Sodium Sulphite Solution.	Grams of Silver Chloride Dissolved per 100 c. c.
1.04 grams per 100 c. c. of water.	0.007
2.08 " " " "	0.020
4.16 " " " "	0.070
6.24 " " " "	0.110
8.35 " " " "	0.150
16.70 " " " "	0.310
20.83 " " " "	0.400

SOLUBILITY OF SILVER CHLORIDE IN SOLUTIONS OF SODIUM THIOSULPHATE OF VARIOUS DEGREES OF CONCENTRATION.

(*W. de W. Abney.*)

Strength of Sodium Thiosulphate Solution.	Grams of Silver Chloride Dissolved per 100 c. c.
2.08 grams per 100 c. c. of water.	0.29
4.16 " " " "	0.64
6.24 " " " "	0.88
8.35 " " " "	1.26
16.70 " " " "	2.54
20.83 " " " "	3.28

DENSITIES OF WATER SOLUTIONS OF ALBUMEN AT 15.5° CELSIUS.

(*Eder's Year Book of Photography.*)

Per Cent. Albumen.	° Bé.	Sp. Gr.	Per Cent. Albumen.	° Bé.	Sp. Gr.	Per Cent. Albumen.	° Bé.	Sp. Gr.
1	0.37	1.0026	15	5.82	1.0384	40	13.78	1.1058
2	0.77	1.0054	20	7.06	1.0515	45	15.48	1.1204
3	1.12	1.0078	25	8.72	1.0644	50	17.16	1.1352
5	1.85	1.0130	30	10.42	1.0780	55	18.90	1.1511
10	3.66	1.0261	35	12.12	1.0919			

DENSITIES OF VARIOUS MIXTURES OF ALCOHOL AND ETHER AT 15° CELSIUS.

(*Eder's Year Book of Photography.*)

Per Cent. Alcohol 0.809 Sp. Gr.	Sp. Gr.	Per Cent. Alcohol 0.809 Sp. Gr.	Sp. Gr.
0	0.729	60	0.779
10	0.737	70	0.786
20	0.747	80	0.798
30	0.756	90	0.801
40	0.765	100	0.809
50	0.772		

DENSITIES OF WATER SOLUTIONS OF CUPRIC CHLORIDE AT 17.5° CELSIUS.

(*Franz.*)

Sp. Gr.	Per Cent. $Cu\,Cl_2$.	Sp. Gr.	Per Cent. $Cu\,Cl_2$.	Sp. Gr.	Per. Cent. $Cu\,Cl_2$.
1.0182	2	1.1696	16	1.3618	30
1.0364	4	1.1958	18	1.3950	32
1.0548	6	1.2228	20	1.4287	34
1.0734	8	1.2501	22	1.4615	36
1.0920	10	1.2779	24	1.4949	38
1.0178	12	1.3058	26	1.5284	40
1.1436	14	1.3338	28		

DENSITIES OF WATER SOLUTIONS OF FERRIC CHLORIDE AT 17.5° CELSIUS.

(*Franz.*)

Sp. Gr.	Per Cent. Fe_2Cl_6.	Sp. Gr.	Per Cent. Fe_2Cl_6.	Sp. Gr.	Per Cent. Fe_2Cl_6.
1.0146	2	1.1746	22	1.3870	42
1.0292	4	1.1950	24	1.4118	44
1.0439	6	1.2155	26	1.4367	46
1.0587	8	1.2365	28	1.4617	48
1.0734	10	1.2568	30	1.4867	50
1.0894	12	1.2778	32	1.5153	52
1.1054	14	1.2988	34	1.5439	54
1.1215	16	1.3199	36	1.5729	56
1.1378	18	1.3411	38	1.6023	58
1.1542	20	1.3622	40	1.6317	60

DENSITIES OF WATER SOLUTIONS OF SILVER NITRATE AT 16° CELSIUS.

(*Dawson.*)

°Tw.	°Bé.	Sp. Gr.	Per Cent. $AgNO_3$.	°Tw.	°Bé.	Sp. Gr.	Per Cent. $AgNO_3$.	°Tw.	°Bé.	Sp. Gr.	Per Cent. $AgNO_3$.
4	2.7	1.021	2.08	19	12.4	1.097	10.41	34	20.9	1.172	18.75
8	5.4	1.040	4.16	23	14.9	1.116	12.50	38	23.0	1.191	20.83
12	8.0	1.059	6.24	27	17.1	1.135	14.58	42	25.0	1.209	22.91
16	10.6	1.078	8.35	30	18.8	1.152	16.66	45	26.4	1.227	25.00

DENSITIES OF WATER SOLUTIONS OF CHROME ALUM.

(*Franz.*)

Sp. Gr.	Per Cent.	Sp. Gr.	Per Cent.
1.0174	5	1.1896	40
1.0342	10	1.2894	50
1.0746	20	1.4566	60
1.1274	30	1.6362	70

DENSITIES OF WATER SOLUTIONS OF POTASH OR AMMONIA ALUM AT 17.5° CELSIUS.

(*Eder's Year Book of Photography.*)

Sp. Gr. of $K_2Al_2(SO_4)_4+24Aq.$ Solution.	Sp. Gr. of $(NH_4)_2Al_2(SO_4)_4+24Aq.$ Solution.	Per Cent.
1.0065	1.0060	1
1.0110	1.0109	2
1.0166	1.0156	3
1.0218	1.0200	4
1.0269	1.0255	5
1.0320	1.0305	6

DENSITIES OF WATER SOLUTIONS OF SULPHUROUS ACID AT 15° CELSIUS.

(*Scott.*)

Sp. Gr.	Per Cent. SO_2.	Sp. Gr.	Per Cent. SO_2.
1.0028	0.5	1.0302	5.5
1.0056	1.0	1.0328	6.0
1.0085	1.5	1.0353	6.5
1.0113	2.0	1.0377	7.0
1.0141	2.5	1.0401	7.5
1.0168	3.0	1.0426	8.0
1.0194	3.5	1.0450	8.5
1.0221	4.0	1.0474	9.0
1.0248	4.5	1.0497	9.5
1.0275	5.0	1.0520	10.0

DENSITIES OF WATER SOLUTIONS OF SODIUM HYDRATE AT 15° CELSIUS.

(*Eder's Year Book of Photography.*)

°Tw.	°Bé.	Sp. Gr.	Per Cent. NaOH.	°Tw.	°Bé	Sp. Gr.	Per Cent. NaOH.
2	1.4	1.012	1	34	20.9	1.170	15
5	3.4	1.023	2	45	26.4	1.225	20
7	4.7	1.035	3	56	31.5	1.279	25
9	6.0	1.046	4	66	35.8	1.332	30
12	8.0	1.059	5	77	40.1	1.384	35
14	9.4	1.070	6	87	43.8	1.437	40
16	10.6	1.081	7	98	47.4	1.488	45
18	11.9	1.092	8	108	50.6	1.540	50
21	13.6	1.103	9	118	53.6	1.591	55
23	14.9	1.115	10	129	56.6	1.643	60

DENSITIES OF WATER SOLUTIONS OF SODIUM THIOSULPHATE AT 20° CELSIUS.

(*Schiff.*)

°Tw.	°Bé.	Sp. Gr.	Per Cent. $Na_2S_2O_3+5Aq.$	Per Cent. $Na_2S_2O_3.$	°Tw.	°Bé.	Sp. Gr.	Per Cent. $Na_2S_2O_3+5Aq.$	Per Cent. $Na_2S_2O_3.$
5	3.4	1.0264	5	3.185	33	20.8	1.1676	30	19.113
11	7.4	1.0529	10	6.371	40	24.0	1.1986	35	22.298
16	10.6	1.0807	15	9.556	46	26.9	1.2297	40	25.484
22	14.2	1.1087	20	12.742	52	29.7	1.2624	45	28.669
28	17.7	1.1381	25	15.927	59	32.8	1.2954	50	31.855

DENSITIES OF WATER SOLUTIONS OF CERTAIN ALKALINE BROMIDES AT 20° CELSIUS.

(*Gerlach.*)

Per. Cent.	Potassium Bromide.	Lithium Bromide.	Sodium Bromide.	Barium Bromide.	Calcium Bromide.	Strontium Bromide.	Magnesium Bromide.
5	1.037	1.035	1.040	1.045	1.044	1.046	1.043
10	1.075	1.072	1.080	1.092	1.089	1.094	1.087
15	1.116	1.113	1.125	1.144	1.139	1.146	1.137
20	1.159	1.156	1.174	1.201	1.194	1.204	1.191
25	1.207	1.204	1.226	1.262	1.252	1.266	1.247
30	1.256	1.254	1.281	1.329	1.315	1.332	1.310
35	1.309	1.309	1.344	1.405	1.385	1.410	1.377
40	1.366	1.368	1.410	1.485	1.461	1.492	1.451
45	1.430	1.432	1.483	1.580	1.549	1.590	1.535
50		1.500	1.565	1.685	1.641	1.694	1.625
55		1.580		1.800			

DENSITIES OF WATER SOLUTIONS OF CERTAIN ALKALINE IODIDES AT 20° CELSIUS.

(*Gerlach.*)

Per Cent.	Potassium Iodide.	Lithium Iodide.	Sodium Iodide.	Barium Iodide.	Calcium Iodide.	Strontium Iodide.	Magnesium Iodide.
5	1.038	1.038	1.040	1.045	1.044	1.045	1.043
10	1.078	1.079	1.082	1.091	1.090	1.091	1.088
15	1.120	1.124	1.128	1.143	1.140	1.142	1.139
20	1.166	1.172	1.179	1.201	1.198	1.200	1.194
25	1.218	1.224	1.234	1.265	1.260	1.262	1.254
30	1.271	1 280	1.294	1.333	1.321	1.330	1.320
35	1.331	1.344	1.360	1.412	1.398	1.410	1.395
40	1.396	1.414	1.432	1.495	1.477	1.491	1.474
45	1.469	1.489	1.510	1.596	1.567	1.590	1.553
50	1.546	1.575	1.600	1.704	1.665	1.695	1.688
55	1.636	1.670	1.700	1.825	1.780	1.812	1.780
60	1.734	1.777	1.810	1.970	1.910	1.955	1.915
65						2.150	

DENSITIES OF WATER SOLUTIONS OF SODIUM CHLORIDE AT 20° CELSIUS.

(*Schiff.*)

Per Cent.	°Tw.	°Bé.	Sp. Gr.	Per Cent.	°Tw.	°Bé.	Sp. Gr.	Per Cent.	°Tw.	°Bé.	Sp. Gr.	Per Cent.	°Tw.	°Bé.	Sp. Gr.	Per Cent.	°Tw.	°Bé.	Sp. Gr.
1	1	0.7	1.0066	7	10	6.7	1.0483	13	19	12.4	1.0934	19	28	17.7	1.1408	25	38	23.0	1.1906
2	3	2.1	1.0133	8	11	7.4	1.0556	14	20	13.0	1.1012	20	30	18.8	1.1490	26	40	24.0	1.1990
3	4	2.7	1.0201	9	13	8.7	1.0630	15	22	14.2	1.1090	21	31	19.8	1.1572	27	41	24.5	1.2075
4	5	3.4	1.0270	10	14	9.4	1.0705	16	23	14.9	1.1168	22	33	20.8	1.1655	..	..	..	..
5	7	4.7	1.0340	11	16	10.6	1.0781	17	25	16.0	1.1247	23	35	21.4	1.1738	..	..	..	..
6	8	5.4	1.0411	12	17	11.2	1.0857	18	27	17.1	1.1327	24	36	22.0	1.1822	..	..	..	..

DENSITIES OF WATER SOLUTIONS OF AMMONIA AT 14° CELSIUS.

(*Carius.*)

Specific Gravity.	Percentage of Ammonia.	Specific Gravity.	Percentage of Ammonia.
0.8844	36.0	0.9314	18.0
0.8864	35.0	0.9347	17.0
0.8885	34,0	0.9380	16.0
0.8907	33.0	0.9414	15.0
0.8929	32.0	0.9449	14.0
0.8953	31.0	0.9484	13.0
0.8976	30.0	0.9520	12.0
0.9001	29.0	0.9556	11.0
0.9026	28.0	0.9593	10.0
0.9052	27.0	0.9631	9.0
0.9078	26.0	0.9670	8.0
0.9106	25.0	0.9709	7.0
0.9133	24.0	0.9749	6.0
0.9162	23.0	0.9790	5.0
0.9191	22.0	0.9831	4.0
0.9221	21.0	0.9873	3.0
0.9251	20.0	0.9915	2.0
0.9283	19.0	0.9959	1.0

DENSITIES OF SODIUM CARBONATE SOLUTIONS.

By Arthur H. Elliott, Ph. D.

Based upon the specific gravity table of Schiff in *Chemiker Kalender*. Temperature 23° C. (73° F.). The gallon is that of the United States, and contains 133.28 ounces of water. The ounce contains 437.5 grains. The first four columns give percentage by weight and weight in 100 volumes of the crystals (10 molecules water) and dry salt respectively.

Grams of Crystals in 100 grms.	Grams of Crystals in 100 c. c.	Grams of Dry Salt in 100 grms.	Grams of Dry Salt in 100 c. c.	Ounces Crystals in one gallon.	Grains Crystals in one fluid ounce.	Specific Gravity.	Degree Beaume.	Degree Twaddell.
50	60.2	18.53	22.31	80	262.5	1.204	24	40
45	53.2	16.67	19.75	71	232.	1.188	23	38
40	46.5	14.82	17.30	62	203.	1.162	20	32
35	40.0	12.97	14.83	53	174.5	1.141	18	28
30	33.6	11.12	12.32	45	147.	1.120	16	24
25	27.5	9.26	10.23	37	110.	1.099	13	20
20	21.6	7.41	8.00	29	94.5	1.079	10.5	16
15	15.9	5.56	5.83	21	69.5	1.059	8	12
10	10.4	3.70	3.85	14	45.5	1.039	5.4	8
5	5.1	1.85	1.86	7	22.8	1.019	2.7	4
2	2.0	.74	.76	3	8.8	1.008	1	1.4

DENSITIES OF POTASSIUM CARBONATE SOLUTIONS.

By Arthur H. Elliott, Ph. D.

Based upon the specific gravity table of Gerlach in *Chemiker Kalender*. Temperature 15° C. (30° F.). The gallon is that of the United States, and contains 133.28 ounces of water. The ounce contains 437.5 grains. Dry potassium carbonate is understood in the figures given, and the first two columns give percentages by weight and weight in 100 volumes.

Grams in 100 grams.	Grams in 100 c. c.	Ounces in one gallon.	Grains in one fl. oz.	Specific Gravity.	Degree Beaume.	Degree Twaddell.
52	81.6	100.	357	1.570	53	114
50	77.2	103.	338	1.544	51	108
45	66.6	89.	291	1.480	47	96
40	56.7	76.	248	1.419	43	84
35	47.5	63.	208	1.359	38	72
30	39.0	52.	171	1.301	33	58
25	31.1	41.5	137	1.246	29	51
20	23.8	32.	105	1.193	24	40
15	17.1	23.	75	1.142	18	28
10	10.9	14.5	44	1.093	12	18
5	5.2	7.	23	1.046	7	10
2	2.0	2.7	9	1.018	2.5	3

DENSITIES OF SATURATED SOLUTIONS.

The following solutions are saturated at 60° F. and the table gives the specific gravity, degrees Beaume and Twaddell, and the percentage of salt *by weight.*

	Specific Gravity.	Degree Beaume.	Degree Twaddell.	Percentage of Salt by Weight.
Alum (Ammonia) Crystallized	1.048	7	10	11
Potassium Carbonate Dry	1.571	52	112	52
" Oxalate	1.262	30	52	25
Sodium Carbonate (10 molecules water)	1.199	24	40	49
" Hyposulphite (5 " ")	1.210	25	41	58
" Sulphite (7 " ")	1.197	24	40	35

DENSITIES OF SODIUM SULPHITE SOLUTIONS.

By Arthur H. Elliott, Ph. D.

Based upon experiments made specially for the construction of this table, temperature 15° C. (60° F.). The gallon is that of the United States, and contains 133.28 ounces of water; the ounce contains 437.5 grains of water. Crystallized sodium sulphite with seven molecules of water is understood in the figures given, and the first two columns give percentage by weight and weight in 100 volumes.

Grams in 100 grams.	Grams in 100 c. c.	Ounces in one gallon.	Grains in one fl. oz.	Specific Gravity.	Degree Beaume.	Degree Twaddell.
35.1	42.0	54.2	184	1.1969	24	40
30	35.0	46.6	153	1.1675	21	34
25	28.5	38.0	122	1.1381	17	27
20	22.2	29.6	97	1.1087	11	17
15	16.2	21.6	61	1.0793	10.5	15
10	10.5	14.0	46	1.0499	7.0	10
5	5.1	6.8	22.3	1.0205	3.0	4
2	2.0	2.7	8.8	1.0100	2.0	2

DENSITIES OF HOT SOLUTIONS FOR OBTAINING CRYSTALS OF THE FOLLOWING SUBSTANCES ON COOLING.

Substance.	°Bé.	Substance.	°Be.
Acetate of Lead	42	Chloride of Calcium	40
" " Sodium	22	" " Copper	45
Oxalic Acid	12	" " Magnesium	35
Ammonia Alum	20	" " Potassium	25
Potash "	20	Bichromate of Ammonia	28
Nitrate of Lead	50	" " Potash	38
" " Potash	28	Chromate of Sodium	45
" " Soda	40	Hyposulphite of Sodium	3
Barium Hydrate	12	Iodide of Potassium	60
Borax	24	Oxalate of "	30
Bromide of Ammonium	30	Permanganate of Potassium	25
" " Cadmium	65	Phosphate of Soda	20
" " Potassium	40	Sulphate of Copper	30
" " Sodium	55	" " Iron (Copperas)	31
" " Strontium	50	" " Zinc	45
Carbonate of Sodium	28	Sulphite of Soda	25
Chlorate of Potash	22	Sulphocyanide of Ammonia	18
" " Sodium	43	Neutral Tartrate of Potash	38
Chloride of Ammonium	12	Rochelle Salts	36
" " Barium	35		

EQUIVALENT WEIGHTS OF CERTAIN SILVER COMPOUNDS, ETC.

By A. H. Elliott, Ph.D.

One part of silver, or one part of silver nitrate, is equal to the following parts of other combinations:

	Silver Chloride.	Silver Bromide.	Silver Iodide.	Potassium Chloride.	Potassium Bromide.
Silver	1.328	1.740	2.176	.690	1.102
Silver Nitrate.	.844	1.106	1.382	.489	.701

	Potassium Iodide.	Sodium Chloride.	Sodium Bromide.	Sodium Iodide.	Ammonium Chloride.
Silver	1.538	.541	.953	1.388	.495
Silver Nitrate.	.971	.344	.606	.882	.315

	Ammonium Bromide.	Ammonium Iodide.	Cadmium Chloride.	Cadmium Bromide.	Cadmium Iodide.
Silver	.907	1.342	1.868	1.776	2.211
Silver Nitrate.	.576	.853	.538	.800	1.076

EQUIVALENT WEIGHTS OF CERTAIN GOLD COMPOUNDS.

(Eder's Year Book of Photography.)

Gold.	Gold Chloride (Anhyd.)	Gold Chloride (Crystallized.)	Double Chloride of Gold and Potassium.	Double Chloride of Gold and Sodium.	Double Chloride of Gold and Calcium.	Fizeau's Salt.
1	1.540	1.814	2.148	2.020	2.096	2.670
0.649	1	1.178	1.394	1.310	1.360	1.700
0.554	0.849	1	1.183	1.113	1.155	1.471
0.465	0.717	0.844	1	0.941	0.976	1.219
0.494	0.762	0.898	1.062	1	1.037	1.321
0.477	0.735	0.869	1.024	1.963	1	1.273
0.374	0.575	0.679	0.804	0.757	0.781	1

ACETIC ACID.

Quantities of crystallizable acid in mixtures of acetic acid and water of various densities at 15° C.

Parts of Crystallizable Acid in 100.	Specific Gravity.	Parts of Crystallizable Acid in 100.	Specific Gravity.	Parts of Crystallizable Acid in 100.	Specific Gravity.	Parts of Crystallizable Acid in 100.	Specific Gravity.
100	1.0553	75	1.0746	50	1.0615	25	1.0350
99	1.0580	74	1.0744	49	1.0607	24	1.0337
98	1.0604	73	1.0742	48	1.0598	23	1.0324
97	1.0625	72	1.0740	47	1.0589	22	1.0311
96	1.0644	71	1.0737	46	1.0580	21	1.0298
95	1.0660	70	1.0733	45	1.0571	20	1.0284
94	1.0674	69	1.0729	44	1.0562	19	1.0270
93	1.0686	68	1.0725	43	1.0552	18	1.0256
92	1.0696	67	1.0721	42	1.0543	17	1.0242
91	1.0705	66	1.0717	41	1.0533	16	1.0228
90	1.0713	65	1.0712	40	1.0523	15	1.0214
89	1.0720	64	1.0707	39	1.0513	14	1.0201
88	1.0726	63	1.0702	38	1.0502	13	1.0185
87	1.0731	62	1.0697	37	1.0492	12	1.0171
86	1.0736	61	1.0691	36	1.0481	11	1.0157
85	1.0739	60	1.0685	35	1.0470	10	1.0142
84	1.0742	59	1.0679	34	1.0459	9	1.0127
83	1.0744	58	1.0673	33	1.0447	8	1.0113
82	1.0746	57	1.0666	32	1.0436	7	1.0098
81	1.0747	56	1.0660	31	1.0424	6	1.0083
80	1.0748	55	1.0653	30	1.0412	5	1.0067
79	1.0748	54	1.0646	29	1.0400	4	1.0052
78	1.0748	53	1.0638	28	1.0388	3	1.0037
77	1.0748	52	1.0631	27	1.0375	2	1.0022
76	1.0747	51	1.0628	26	1.0363	1	1.0007

N. B.—The density of the mixture increases until nearly 25 % of water is present, after which it again decreases. Acetic acid is, therefore, better tested volumetrically with a standard solution of alkali.

SULPHUROUS ACID.

Quantities of anhydrous sulphurous acid in solutions of different densities.

(*F. Authon.*)

Specific Gravity.	Anhydrous Acid in 100.	Specific Gravity.	Anhydrous Acid in 100.	Specific Gravity.	Anhydrous Acid in 100.	Specific Gravity.	Anhydrous Acid in 100.
1.046	9.54	1.027	6.68	1.020	4.77	1.013	2.86
1.036	8.59	1.023	5.72	1.016	3.82	1.009	1.90
1.031	7.63					1.005	0.95

ALCOHOL.

Specific Gravities of Mixtures of Different Proportions of Alcohol (s. g. .7932) and Water, by Weight and by Volume, at 14° R. (63.5° F.).—MEISSNER.

Parts of Alcohol.	Parts of Water.	Specific Gravity of Mixture by Weight.	Specific Gravity of Mixture by Volume.	Parts of Alcohol.	Parts of Water.	Specific Gravity of Mixture by Weight.	Specific Gravity of Mixture by Volume.
100	0	0.7932	0.7932	49	51	0.9196	0.9324
99	1	0.796	0.7969	48	52	0.9219	0.9344
98	2	0.7988	0.8006	47	53	0.9242	0.9364
97	3	0.8016	0.8042	46	54	0.9264	0.9384
96	4	0.8045	0.8078	45	55	0.928	0.9404
95	5	0.8074	0.8114	44	56	0.9308	0.9424
94	6	0.8104	0.815	43	57	0.9329	0.9443
93	7	0.8135	0.8185	42	58	0.9350	0.9461
92	8	0.8166	0.8219	41	59	0.9371	0.9478
91	9	0.8196	0.8253	40	60	0.9391	0.9495
90	10	0.8225	0.8286	39	61	0.9410	0 9512
89	11	0.8252	0.8317	38	62	0.9429	0 9529
88	12	0.8279	0.8346	37	63	0.9448	0.9547
87	13	0.8304	0.8373	36	64	0.9467	0.9564
86	14	0.8329	0.840	35	65	0.9486	0.958
85	15	0.8353	0.8427	34	66	0.9505	0.9595
84	16	0.8376	0.8454	33	67	0.9524	0.9609
83	17	0.8399	0.8481	32	68	0.9543	0.9621
82	18	0.8422	0.8508	31	69	0.9561	0.9632
81	19	0.8446	0.8534	30	70	0.9578	0.9643
80	20	0.847	0.8561	29	71	0.9594	0.9654
79	21	0.8494	0.8596	28	72	0.9608	0.9665
78	22	0.8519	0.8616	27	73	0.9621	0.9676
77	23	0.8543	0.8642	26	74	0.9634	0.9688
76	24	0.8567	0.8668	25	75	0.9647	0.970
75	25	0.859	0.8695	24	76	0.966	0.9712
74	26	0.8613	0.8723	23	77	0.9673	0.9723
73	27	0.8635	0.8751	22	78	0.9686	0.9734
72	28	0.8657	0.8779	21	79	0.9699	0.9745
71	29	0.868	0.8806	20	80	0.9712	0.9756
70	30	0.8704	0.8833	19	81	0.9725	0.9766
69	31	0.8729	0.886	18	82	0.9738	0.9775
68	32	0.8755	0.8885	17	83	0.9751	0.9784
67	33	0.8781	0.891	16	84	0.9763	0.9793
66	34	0.8806	0.8934	15	85	0.9795	0.9803
65	35	0.8831	0.8958	14	86	0.9786	0.9813
64	36	0.8855	0.8982	13	87	0.9796	0.9823
63	37	0.8879	0.9096	12	88	0.9803	0.9834
62	38	0.8902	0.9029	11	89	0.9817	0.9846
61	39	0.8925	0.9052	10	90	0.9830	0.9859
60	40	0.8948	0.9075	9	91	0.9844	0.9873
59	41	0.8971	0.9098	8	92	0.9860	0.9888
58	42	0.8994	0.9121	7	93	0.9873	0.9901
57	43	0.9016	0.9145	6	94	0.9897	0.9915
56	44	0.9038	0.9168	5	95	0.9914	0.9929
55	45	0.9060	0.9191	4	96	0.9931	0.9943
54	46	0.9082	0.9124	3	97	0.9948	0.9957
53	47	0.9104	0.9237	2	98	0.9965	0.9971
52	48	0.9127	0.9159	1	99	0.9982	0.9985
51	49	0.915	0.9281	0	100	1.0000	1.0000
50	50	0.6173	0.9303	--	--	--	--

THE SIMPLIFICATION OF EMULSION CALCULATIONS.

From British Journal of Photography Almanac.

With a view of simplifying the calculations involved in emulsion making, Mr. William Ackland has worked out some useful tables, which will enable even those most ignorant of chemical philosophy to calculate with ea c and rapidity the proper quantities of silver or haloid saits in any formula. Even those who are able to perform the calculations in the recognized style will find their labors materially lightened by means of these tables, which should be kept in a convenient place for reference in every laboratory.

No. I.

	Equivalent weights.	Weight of $AgNO_3$ required to convert one grain of soluble haloid.	Weight of soluble haloid required to convert one grain $AgNO_3$.	Weight of *silver* haloid produced by one grain of *soluble* haloid.	Weight of *soluble* haloid required to produce one grain of *silver* haloid.	Weight of silver haloid produced from one grain $AgNO_3$.
Ammonium bromide	98.	1.734	.576	1.918	.521	1.106
Potassium "	119.1	1.427	.700	1.578	.633	
Sodium "	103.	1.650	.606	1.825	.548	
Cadmium " com.	172.	.988	1.012	1.093	.915	
" " anh.	136.	1.25	.800	1.382	.723	
Zinc "	112.1	1.509	.663	1.670	.600	
Ammonium chloride	53.5	3.177	.315	2.682	.378	.844
Sodium "	58.5	2.906	.344	2.453	.408	
Ammonium iodide	145.	1.172	.853	1.620	.617	1.382
Potassium "	166.1	1.023	.977	1.415	.707	
Sodium "	150.	1.133	.882	1.566	.638	
Cadmium "	183.	.929	1.076	1.284	.778	

The principal bromides, chlorides and iodides which are likely to be used in emulsions of either gelatine or collodion have been included in these tables. Table No. 1 presents to the reader, without any mystification which may be involved in equivalents, the actual weights of haloid or silver as the case may be, required to convert or combine with one grain of the other.

In order to test the utility of this table, let us suppose that it is desired to make (say) ten ounces of emulsion by a new formula, which, for the sake of showing the working of the table, we will write down as follows:

Bromide of potassium	150 grains.	Chloride of ammonium	10 grains.
Iodide of potassium	10 "	Gelatine	200 "

Now, we want to know how much silver nitrate should be employed in sensitizing this mixture. For this purpose we use the first column, in which we find against each haloid the exact quantity of silver nitrate required to fully decompose one grain. Taking, then, the figures we find in column No. 1 against the three salts in the above formula, and multiplying them by the number of grains of each used, we have the following sum:

Potassium bromide	$150 \times 1.427 = 214.$	Weight silver nitrate required.
" iodide	$10 \times 1.023 = 10.23$	
Chloride of ammonium	$10 \times 3.177 = 31.77$	

or the total quantity of silver nitrate required for full conversion .... 256. grains.

No. II.

	Ammonium Bromide.	Potassium Bromide.	Sodium Bromide.	Cadmium Bromide (Com'l.)	Cadmium Bromide (Anhyd.).	Zinc Bromide.	Ammonium Chloride.	Sodium Chloride.	Ammonium Iodide.	Potassium Iodide.	Sodium Iodide.	Cadmium Iodide.
Ammonium bromide....	**1**	.823	.951	.57	.72	.87	1.832	1.675	.676	.59	.653	.535
Potassium "	1.215	**1**	1.156	.692	.876	1.058	2.226	2.036	.821	.717	.794	.651
Sodium "	1.051	.865	**1**	.599	.757	.915	1.925	1.761	.71	.62	.686	.563
Cadmium " com.	1.755	1.444	1.67	**1**	1.265	1.527	3.215	2.94	1.186	1.035	1.146	.94
" " anh.	1.387	1.141	1.32	.79	**1**	1.207	2.542	2.324	.938	.819	.906	.743
Zinc "	1.149	.945	1.093	.655	.828	**1**	2.104	1.925	.776	.678	.75	.615
Ammonium chloride.....	.546	.449	.519	.311	.393	.475	**1**	.914	.369	.322	.356	.292
Sodium "	.597	.491	.568	.34	.43	.519	1.093	**1**	.403	.352	.39	.319
Ammonium iodide......	1.479	1.217	1.408	.843	1.066	1.287	2.712	2.478	**1**	.873	.966	.792
Potassium "	1.695	1.394	1.612	.965	1.221	1.475	3.104	2.839	1.145	**1**	1.107	.907
Sodium "	1.53	1.259	1.456	.872	1.103	1.332	2.803	2.564	1.034	.903	**1**	.819
Cadmium "	1.867	1.536	1.776	1.064	1.345	1.625	3.42	3.128	1.262	1.102	1.22	**1**

Table No. II gives in separate columns the relative converting values of each of the soluble haloid salts in ordinary use, showing how much of any salt must be used to replace one grain of any other. In each column will be found a unit (printed in large type) which represents one grain of the salt named at the head of the column; the other figures in the same column show the exact quantities of the other salts which must be used in lieu of a single grain of that particular haloid. Thus, taking the first column, which is headed "Ammonium Bromide," we find against ammonium bromide in the margin the figure 1, representing one grain of that salt. If we wish to know the relative convert'ng power of potassium bromide, we take the number in the same column which stands against the latter salt in the margin, viz., 1.215; that is to say, 1.215 grain of potassium bromide will be required to do the same work as one.

PREPARING PERCENTAGE SOLUTIONS.

By C. C. Sherrard, Ph. C.

The first table gives percentage soluticns; the second gives parts in 1,000 or less. The use of the first is as follows: Run down column one until the correct percentage wanted is found, then move to the right along the line until the column is found giving the amount of fluid measure to be made up; at the intersection will be found the weight of salt required. It must be remembered that this is the amount of water to take, and not q. s. water to make the volume; also that these tables are true only for water, and not for alcohol or other fluids.

For Making any Quantity of Percentage Solutions.

To make	For each 1 fluid ounce of water take of the salt	For each 2 fluid ounces of water take of the salt	For each 3 fluid ounces of water take of the salt	For each 4 fluid ounces of water take of the salt	For each 5 fluid ounces of water take of the salt	For each 10 fluid ounces of water take of the salt	For each 16 fluid ounces of water take of the salt
	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.
1 per cent	4.557	9.114	13.671	18.228	22.785	45.57	72.912
2 per cent	9.114	18.228	27.342	36.456	45.570	91.14	145.824
3 per cent	13.671	27.352	41.013	54.684	68,355	136.71	218.416
4 per cent	18.228	36.456	54.684	72.912	91.14	182.28	291.648
5 per cent	22.785	45.57	68.355	91.14	113.925	227.85	364.56
10 per cent	45.57	91.14	136.71	182.28	227.85	455.7	729.12
15 per cent	68.355	136.71	205.065	273.42	341.775	68.355	1093.68
20 per cent	91.14	182.28	273.42	364.56	455.70	911.4	1458.24
25 per cent	113.925	227.85	341.775	455.70	569.625	1139.25	1822.80
40 per cent	182.28	364.56	546.84	729.12	911.4	1822.8	2916.48

For Making any Quantity of Solution When Stated in Parts per 1,000, 100, etc.

To make solution of	For each 1 fluid ounce of water take of the salt	For each 2 fluid ounces of water take of the salt	For each 3 fluid ounces of water take of the salt	For each 4 fluid ounces of water take of the salt	For each 5 fluid ounces of water take of the salt	For each 10 fluid ounces of water take of the salt	For each 16 fluid ounces of water take of the salt
	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.	Grains.
1 in 1,000	.4557	.9114	1.3671	1.8228	2.278	4.557	7.291
1 in 500	.9114	1.8228	2.7342	3.6456	4.557	9.114	14.582
1 in 400	1.139	2.278	3.4177	4.557	5.695	11.392	18.228
1 in 300	1.519	3.035	4.557	6.076	7.59	15.19	24.304
1 in 200	2.2785	4.557	6.8355	9.114	11.39	22.785	36.456
1 in 100	4.557	9.114	13.671	18.228	22.785	45.57	72.912
1 in 50	9.114	18.228	27.342	36.456	45.57	91.14	145.824
1 in 25	18.228	36.456	54.684	72.912	91.14	182.28	291.648
1 in 10	45.570	91.140	136.710	182.280	227.85	455.70	729.120
1 in 5	91.14	182.28	273.42	364.56	455.7	911.4	1458.24

We may say that, in giving the above figures, the resulting solution is correct as regards percentage composition, though it may measure slightly more than the water taken, owing to the increase in volume which always take place in some degree when a solid passes into a solution in a given amount of liquid. This expansion is not appreciable for small amounts of the solid, say up to 5 per cent., but at 25 per cent. or more it may be noticeable.

THE CONVERSION OF GRAMMES (OR CUBIC CENTIMETERS) INTO OUNCES AND GRAINS, and *vice versa*.

Conversion of Grammes into Grains.

Grammes.	Grains.
1	15.43
2	30.86
3	46.29
4	61.73
5	77.16
6	92.59
7	108.03
8	123.46
9	138.89

Conversion of Grains into Grammes.

Grains.	Grammes.
1	.0648
2	.1296
3	.1944
4	.2592
5	.3240
6	.3888
7	.4536
8	.5184
9	.5832

Conversion of Grammes into Troy Ounces.

Grammes.	Troy Ounces.
1	.03215
2	.06430
3	.09645
4	.12860
5	.16075
6	.19290
7	.22505
8	.25720
9	.28935

Conversion of Troy Ounces into Grammes.

Troy Ounces.	Grammes.
1	31.103
2	62.207
3	93.310
4	124.414
5	155.517
6	186.621
7	217.724
8	248.828
9	279.931

Conversion of Grammes into Avoirdupois Ounces.

Grammes.	Avoirdupois Ounces.
1	.03527
2	.07054
3	.10581
4	.14108
5	.17635
6	.21162
7	.24689
8	.28216
9	.31743

Conversion of Avoirdupois Ounces into Grammes.

Avoirdupois Ounces.	Grammes.
1	28.349
2	56.699
3	85.048
4	113.398
5	141.747
6	170.097
7	198.446
8	226.796
9	255.145

The use of the tables will be best illustrated by an example. Supposing that it is desired to find the equivalent in grains of 324.51 grammes, we proceed by breaking up this number into the following series of constituent parts, and finding the grain-equivalent of each part from the table.

Portions of original number.	Equivalents in grains.
300.	4630.
20.	308.6
4.	61.73
.50	7.716
.01	.1524
	5008.1984

The required quantity is 5008.2 grains. The numbers taken from the table will, in most cases, require a change as regards the position of the decimal point; thus, to find the value of 300 grammes, one refers to the table and finds 46.30 given as the equivalent, and a mere shifting of the decimal point two places towards the right multiplies this by 100, or gives the required number. In a similar manner, by shifting the decimal place of 30.86 one place to the right, we obtain the value in grains of 20 grammes; while the number 61.73 is taken from the table without alteration as the equivalent of 4 grammes. For .50 the table number must have its point shifted to the left, making it 7.716 instead of 77.16; and finally the value of .01 is obtained by shifting the point of 15.43 two places to the left.

THERMOMETRIC TABLES.

Showing the Assimilation of the Thermometers in Use Throughout the World.

Celsius.	Réaumur.	Fahrenheit.	Celsius.	Réaumur.	Fahrenheit.
100	80.0	212.0	49	39.2	120.2
99	79.2	210.0	48	38.4	118.4
98	78.4	208.4	47	37.6	116.6
97	77.6	206.6	46	36.8	114.8
96	76.8	204.8	45	36.0	113.0
95	76.0	203.0	44	35.2	111.2
94	75.2	201.2	43	34.8	109.4
93	74.4	199.4	42	33.6	107.6
92	73.6	197.6	41	32.8	105.8
91	72.8	195.8	40	32.0	104.0
90	72.0	194.0	39	31.2	102.2
89	71.2	192.2	38	30.4	100.4
88	70.4	190.4	37	29.6	98.6
87	69.6	188.6	36	28.8	96.8
86	68.8	186.8	35	28.0	95.0
85	68.0	185.0	34	27.2	93.2
84	67.2	183.2	33	26.4	91.4
83	66.4	181.4	32	25.6	89.6
82	65.6	179.6	31	24.8	87.8
81	64.8	177.8	30	24.0	86.0
80	64.0	176.0	29	23.2	84.2
79	63.2	174.2	28	22.4	82.4
78	62.4	172.4	27	21.6	80.6
77	61.6	170.6	26	20.8	78.8
76	60.8	168.8	25	20.0	77.0
75	60.0	167.0	24	19.2	75.2
74	59.2	165.2	23	18.4	73.4
73	58.4	163.4	22	17.6	71.6
72	57.6	161.6	21	16.8	69.8
71	56.8	159.8	20	16.0	68.0
70	56.0	158.0	19	15.2	66.2
69	55.2	156.2	18	14.4	64.4
68	54.4	154.4	17	13.6	62.6
67	53.6	152.6	16	12.8	60.8
66	52.8	150.8	15	12.0	59.0
65	52.0	149.0	14	11.2	57.2
64	51.2	147.2	13	10.4	55.4
63	50.4	145.4	12	9.6	53.6
62	49.6	143.6	11	8.8	51.8
61	48.8	141.8	10	8.0	50.0
60	48.0	140.0	9	7.2	48.2
59	47.2	138.2	8	6.4	46.4
58	46.4	136.4	7	5.6	44.6
57	45.6	134.6	6	4.8	42.8
56	44.8	132.8	5	4.0	41.0
55	44.0	131.0	4	3.2	39.2
54	43.2	129.2	3	2.4	37.4
53	42.4	127.4	2	1.6	36.5
52	41.6	125.6	1	0.8	33.8
51	40.8	123.8	0	0.0	32.0
50	40.0	122.0			

DR. SCOTT'S TABLE OF COMPARATIVE EXPOSURES.

The following table, compiled by Dr. J. A. Scott, shows the comparative value of daylight at different hours of the day and seasons of the year, and is intended for use in conjunction with that of Mr. W. K. Burton :

Table of Comparative Exposures.

Hour of Day. A.M.	Hour of Day. P.M.	June.	May, July.	April, Aug.	Mar., Sept.	Feb., Oct.	Jan., Nov.	Dec.
12		1	1	1¼	1½	2	3½	4
11	1	1	1	1¼	1½	2½	4	5
10	2	1	1	1¼	1¾	3	5	6
9	3	1	1¼	1½	2	4	*12	*16
8	4	1½	1½	2	3	*10	--	--
7	5	2	2½	3	*6	--	--	--
6	6	2½	*3	*6	--	--	--	--
5	7	*5	*6	--	--	--	--	--
4	8	*12	--	--	--	--	--	--

* The accuracy of these figures would be affected by a yellow sunset.

MR. BURTON'S TABLE OF COMPARATIVE EXPOSURES

(SLIGHTLY ALTERED).

	Sea and Sky.	Open Landscape.	Landscape and Foreground. / Buildings.	Heavy Foliage. Foreground. / Portrait out of Doors.	Portrait in Studio Light.	Portrait in Ordinary Room.	Under Trees. / Fairly Lighted Interiors.	Badly Lighted Interiors.
$\frac{F}{16}$	$\frac{1}{10}$ sec.	$\frac{1}{3}$ sec.	1 sec.	2 sec.	16 sec.	1 min.	$2\frac{1}{2}$ min.	$\frac{1}{2}$ hour.
$\frac{F}{32}$	$\frac{2}{5}$ sec.	$1\frac{1}{3}$ sec.	4 sec.	8 sec.	1 min.	4 min.	10 min.	2 hours.
$\frac{F}{64}$	$1\frac{1}{2}$ sec.	5 sec.	16 sec.	32 sec.	4 min.	16 min.	40 min.	8 hours.

ENLARGEMENTS.

From the British Journal of Photography Almanac.

FOCUS OF LENS.	TIMES OF ENLARGEMENT AND REDUCTION.							
Inches.	**1** Inch.	**2** Inches.	**3** Inches.	**4** Inches.	**5** Inches.	**6** Inches.	**7** Inches.	**8** Inches.
2	4 4	6 3	8 $2\frac{2}{3}$	10 $2\frac{1}{2}$	12 $2\frac{2}{5}$	14 $2\frac{1}{3}$	16 $2\frac{2}{7}$	18 $2\frac{1}{4}$
$2\frac{1}{2}$	5 5	$7\frac{1}{2}$ $3\frac{3}{4}$	10 $3\frac{1}{3}$	$12\frac{1}{2}$ $3\frac{1}{8}$	15 3	$17\frac{1}{2}$ $2\frac{11}{12}$	20 $2\frac{6}{7}$	$22\frac{1}{2}$ $2\frac{13}{16}$
3	6 6	9 $4\frac{1}{2}$	12 4	15 $3\frac{3}{4}$	18 $3\frac{3}{5}$	21 $3\frac{1}{2}$	24 $3\frac{3}{7}$	27 $3\frac{3}{8}$
$3\frac{1}{2}$	7 7	$10\frac{1}{2}$ $5\frac{1}{4}$	14 $4\frac{2}{3}$	$17\frac{1}{2}$ $4\frac{3}{8}$	21 $4\frac{1}{5}$	$24\frac{1}{2}$ $4\frac{1}{12}$	28 4	$31\frac{1}{2}$ $3\frac{15}{16}$
4	8 8	12 6	16 $5\frac{1}{3}$	20 5	24 $4\frac{4}{5}$	28 $4\frac{2}{3}$	32 $4\frac{4}{7}$	36 $4\frac{1}{2}$
$4\frac{1}{2}$	9 9	$13\frac{1}{2}$ $6\frac{3}{4}$	18 6	$22\frac{1}{2}$ $5\frac{5}{8}$	27 $5\frac{2}{5}$	$31\frac{1}{2}$ $5\frac{1}{4}$	36 $5\frac{1}{7}$	$40\frac{1}{2}$ $5\frac{1}{16}$
5	10 10	15 $7\frac{1}{2}$	20 $6\frac{2}{3}$	25 $6\frac{1}{4}$	30 6	35 $5\frac{5}{6}$	40 $5\frac{5}{7}$	45 $5\frac{5}{8}$
$5\frac{1}{2}$	11 11	$16\frac{1}{2}$ $8\frac{1}{4}$	22 $8\frac{1}{3}$	$27\frac{1}{2}$ $6\frac{7}{8}$	33 $6\frac{3}{5}$	$38\frac{1}{2}$ $6\frac{5}{12}$	44 $6\frac{2}{7}$	$49\frac{1}{2}$ $6\frac{3}{16}$
6	12 12	18 9	24 8	30 $7\frac{1}{2}$	36 $7\frac{1}{5}$	42 7	48 $6\frac{6}{7}$	54 $6\frac{3}{4}$
7	14 14	21 $10\frac{1}{2}$	28 $9\frac{1}{3}$	35 $8\frac{3}{4}$	42 $8\frac{2}{5}$	49 $8\frac{1}{6}$	56 8	63 $7\frac{7}{8}$
8	16 16	24 12	32 $10\frac{2}{3}$	40 10	48 $9\frac{3}{5}$	56 $9\frac{1}{3}$	64 $9\frac{1}{7}$	72 9
9	18 18	27 $13\frac{1}{2}$	36 12	45 $11\frac{1}{4}$	54 $10\frac{4}{5}$	63 $10\frac{1}{2}$	72 $10\frac{2}{7}$	81 $10\frac{1}{8}$

The object of this table is to enable any manipulator who is about to enlarge (or reduce) a copy any given number of times, to do so without troublesome calculation. It is assumed that the photographer knows exactly what the focus of his lens is, and that he is able to measure accurately from its optical centre. The use of the table will be seen from the following illustration: A photographer has a *carte* to enlarge to four times its size, and the lens he intends employing is one of six inches equivalent focus. He must therefore, look for 4 on the upper horizontal line, and for 6 in the first vertical column, and carry his eye to where these two join, which will be at 30—7½. The greater of these is the distance the sensitive plate must be from the centre of the lens; and the lesser, the distance of the picture to be copied. To *reduce* a picture any given number of times the same method must be followed, but in this case the greater number will represent the distance between the lens and the picture to be copied: the latter, that between the lens and the sensitive plate. This explanation will be sufficient for every case of enlargement or reduction.

If the focus of the lens be twelve inches, as this number is not in the column of focal lengths, look out for 6 in this column and multiply by 2, and so on with any other numbers.

COMPARATIVE EXPOSURES FOR ENLARGING AND REDUCING.

Compiled by Mr. E. Ferrero, (Camera Club, London).

f/16	*f*/18	*f*/20	*f*/22	*f*/24	*f*/26	*f*/28	*f*/32	*f*/36	*f*/40	*f*/44	*f*/48	*f*/52
m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
0 9	0 11	0 14	0 17	0 20	0 23	0 27	0 36	0 45	0 55	1 7	1 20	1 34
0 13	0 16	0 21	0 25	0 30	0 34	0 40	0 54	1 7	1 23	1 41	2 0	2 20
0 18	0 22	0 28	0 32	0 40	0 46	0 54	1 12	1 30	1 51	2 15	2 40	3 7
0 22	0 28	0 35	0 42	0 50	0 58	1 8	1 30	1 52	2 18	2 48	3 20	3 54
0 27	0 33	0 42	0 50	1 0	1 9	1 21	1 48	2 15	2 46	3 22	4 0	4 40
0 36	0 45	0 55	1 15	1 19	1 33	1 48	2 24	3 0	3 42	4 29	5 20	6 15
0 45	0 55	1 10	1 24	1 40	1 54	2 15	3 0	3 42	4 37	5 36	6 40	7 48
0 55	1 6	1 23	1 38	1 59	2 18	2 42	3 36	4 30	5 33	6 44	8 0	9 21
1 3	1 18	1 37	1 54	2 19	2 42	3 9	4 12	5 15	6 28	7 52	9 20	10 55
1 12	1 30	1 50	2 10	2 38	3 7	3 36	4 48	6 0	7 24	8 58	10 40	12 30
1 21	1 40	2 5	2 30	2 59	3 29	4 4	5 24	6 42	8 19	10 5	12 0	14 3
1 30	1 50	2 20	2 50	3 20	3 48	4 30	6 0	7 22	9 12	11 12	13 20	15 36
1 48	2 12	2 46	3 16	4 0	4 36	5 24	7 12	8 52	11 5	13 28	16 0	18 40
2 6	2 35	3 13	3 48	4 37	5 23	6 18	8 24	10 30	12 56	15 43	18 40	21 50
2 24	3 0	3 40	4 20	5 17	6 14	7 12	9 36	12 0	14 48	17 55	21 20	25 0
2 42	3 20	4 10	4 58	5 58	6 58	8 7	10 48	13 24	16 36	20 10	24 0	28 6
3 0	3 40	4 40	5 36	6 40	7 36	9 0	12 0	14 44	18 25	22 24	26 40	31 12
3 22	4 10	5 15	6 18	7 30	8 33	10 10	13 30	16 36	20 48	25 12	30 0	35 10
3 45	4 36	5 50	7 0	8 19	9 30	11 15	15 0	18 24	23 0	28 0	33 20	39 4
4 7	5 5	6 25	7 42	9 9	10 27	12 27	16 30	20 18	25 20	30 48	36 40	42 57
4 30	6 30	7 0	8 24	10 0	11 24	13 30	18 0	22 6	27 40	33 36	40 0	46 54

COMPARATIVE EXPOSURES FOR ENLARGING AND REDUCING—*Continued.*

f/56	*f*/60	*f*/64	*f*/68	*f*/72	*f*/76	*f*/80	*f*/84	*f*/88	*f*/92	*f*/96	*f*/100
m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
1 48	2 5	2 22	2 40	3 0	3 20	3 42	4 4	4 28	4 54	5 20	5 47
2 42	3 7	3 33	4 0	4 30	5 0	5 33	6 6	6 42	7 21	8 0	8 40
3 37	4 10	4 44	5 20	6 0	6 40	7 24	8 9	8 57	9 48	10 40	11 33
4 30	5 17	5 55	6 40	7 30	8 21	9 15	10 9	11 12	12 17	13 20	14 27
5 25	6 15	7 5	8 0	9 0	10 1	11 6	12 12	13 25	14 42	16 0	17 20
7 12	8 20	9 28	10 40	12 0	13 22	14 48	16 17	17 54	19 36	21 20	23 7
9 0	10 34	11 50	13 22	15 0	16 42	18 30	20 21	22 23	24 33	26 40	28 54
10 50	12 30	14 10	16 1	18 0	20 2	22 12	24 25	26 50	29 24	32 0	34 40
12 40	14 34	16 33	18 42	21 0	23 23	25 54	28 30	31 19	34 18	37 20	40 27
14 24	16 48	18 55	21 22	24 0	26 43	29 36	32 33	35 48	39 12	42 40	46 15
16 12	18 45	21 18	24 3	27 0	30 3	33 18	36 38	40 17	44 10	48 0	52 0
18 0	21 8	23 40	26 44	30 0	33 24	37 0	40 42	44 46	48 56	53 20	57 48
21 40	24 58	28 21	32 0	36 0	40 5	44 24	48 50	53 40	58 48	64 0	69 0
25 20	29 7	33 6	37 23	42 0	46 45	51 48	57 0	62 39	69 0	74 40	81 0
28 48	33 17	37 50	42 43	48 0	53 27	59 12	65 7	71 36	78 0	85 0	92 0
32 36	37 30	42 35	48 5	54 0	60 6	66 36	73 15	80 20	88 0	96 0	104 0
36 0	42 17	47 20	53 28	60 0	66 47	74 0	81 24	89 0	98 0	106 0	116 0
40 48	46 50	53 15	60 20	67 27	75 8	83 15	91 31	100 0	110 0	120 0	130 0
45 0	52 50	59 10	66 40	74 55	83 30	92 30	101 38	111 0	122 0	133 0	144 0
49 51	58 13	65 5	73 30	82 25	91 0	101 45	111 45	124 0	135 0	146 0	159 0
54 0	63 26	71 0	80 0	89 55	100 10	111 0	122 6	134 0	147 0	160 0	174 0

DR. WOODMAN'S TABLE OF VIEW ANGLES.

DIVIDE THE BASE OF THE PLATE BY THE EQUIVALENT FOCUS OF THE LENS.

If the quotient is	The angle is	If the quotient is	The angle is	If the quotient is	The angle is
	Degrees.		Degrees.		Degrees.
.282	16	.748	41	1.3	66
.3	17	.768	42	1.32	67
.317	18	.788	43	1.36	68
.335	19	.808	44	1.375	69
.353	20	.828	45	1.4	70
.37	21	.849	46	1.427	71
.389	22	.87	47	1.45	72
.407	23	.89	48	1.48	73
.425	24	.911	49	1.5	74
.443	25	.933	50	1.53	75
.462	26	.854	51	1.56	76
.48	27	.975	52	1.59	77
.5	28	1.	53	1.62	78
.517	29	1.02	54	1.649	79
.536	30	1.041	55	1.678	80
.555	31	1.063	56	1.7	81
.573	32	1.086	57	1.739	82
.592	33	1.108	58	1.769	83
.611	34	1.132	59	1.8	84
.631	35	1.155	60	1.833	85
.65	36	1.178	61	1.865	86
.67	37	1.2	62	1.898	87
.689	38	1.225	63	1.931	88
.708	39	1.25	64	1.965	89
.728	40	1.274	65	2.	90

This table has been calculated for the use of those who wish to know the precise *angle of view* included by any particular lens on a given size of plate. Its mode of use will be easily seen by inspection.

SIZES OF DRY PLATES MADE IN FRANCE AND GERMANY.

6½ × 9 c. m.	2.5 × 3.6 inches.	21 × 29 c. m.	8.2 × 10.6 inches.
9 × 12 "	3.6 × 4.7 "	24 × 30 "	9.4 × 11.8 "
12 × 15 "	4.7 × 5.9 "	27 × 33 "	10.6 × 12.9 "
13 × 18 "	5.1 × 7.0 "	27 × 35 "	10.6 × 13.7 "
12 × 20 "	4.7 × 7.8 "	30 × 40 "	11.8 × 15.7 "
15 × 21 "	5.9 × 8.2 "	40 × 50 "	15.7 × 19.6 "
15 × 22 "	5.9 × 8.6 "	50 × 60 "	19.6 × 23.6 "
18 × 24 "	7.2 × 9.4 "		

SIZES OF DRY PLATES MADE IN ITALY.

9 × 12 c. m.	3.6 × 4.9 inches.	21 × 29 c. m.	8.2 × 10.6 inches.
12 × 16 "	4.7 × 6.3 "	24 × 30 "	9.4 × 11.8 "
12 × 18 "	4.7 × 7.2 "	29 × 33 "	10.6 × 12.0 "
13 × 18 "	5.1 × 7.0 "	30 × 36 "	11.8 × 14.1 "
12 × 20 "	4.7 × 7.8 "	40 × 50 "	15.7 × 19.6 "
18 × 24 "	7.0 × 9.4 "	50 × 60 "	19.6 × 23.6 "

EQUATIONS RELATING TO FOCI, ETC.

The following simple optical formulæ and calculations, worked out by Mr. J. A. C. Branfill, will prove useful in many branches of photography, especially where several lenses of varying foci are in constant use for a variety of purposes:

Let p = Principal focus.
F = Greater conjugate do.
f = Lesser do. do.
$D = F + f$ = distance of image from object.
r = Ratio of any dimension in original to the same dimension in copy (in case of reduction), or *vice versa* (in case of enlargement).
a = Effective diameter of diaphragm.
U. S. No. = "Uniform System" No. of do.
x = Comparative exposure required.

Then

$$p = D \times \frac{r}{(r+1)^2} = \frac{Ff}{D} = \frac{F}{r+1} = \frac{rf}{r+1}$$

$$F = p(r+1) = \frac{pf}{f-p} = rf = \frac{rD}{r+1}$$

$$f = p \times \frac{(r+1)}{r} = \frac{pF}{F-p} = \frac{D}{r+1} = \frac{F}{r}$$

$$D = p \times \frac{(r+1)^2}{r} = f(r+1) = p\left(2 + r + \frac{1}{r}\right)$$

$$r = \frac{F-p}{p} = \frac{p}{f-p} = \frac{F}{f}$$

$$\text{U. S. No.} = \frac{p^2}{16\,a^2}$$

$$x = \frac{f^2}{16\,a^2} = \frac{p^2}{16\,a^2} \times \frac{(r+1)^2}{r^2}$$

N. B.—For ordinary landscape work, where r is greater than 20, x may be taken as $\frac{p^2}{16\,a^2}$

NOTE.—In case the above may not be clear to some photographers, the following rules may be better understood:

To find the principal focus of a lens (p), focus a near object in the camera, and measure the distance between it and the ground-glass (D); next find the proportion which any dimension in the object bears to the same dimension on the ground-glass (r). Thus, if the original dimension be four times as large as its reproduction, we say that r equals (=) 4. Multiply D by r, and divide the product by the square of a number greater by one than r $(r + 1)^2$. This rule was lately published by Mr. Debenham.

To find the lesser conjugate focus (f) (if p and r are known) multiply p by the sum of $r + 1$ and divide the product by r. Or divide D by $r + 1$.

To find the greater conjugate focus (F) multiply p by $r + 1$. Or multiply f by r.

To find D (the distance which the ground-glass should be from the object to be copied in order to get a given value for r) multiply p by the sum of $r + \frac{1}{r} + 2$.

To find r divide $F - p$ (the difference between F and p) by p. Or divide p by $f - p$. Or divide F by f.

To find x divide the square of f by 16 times the square of a (the diameter of aperture to lens).

For example: Focus an object which is five inches high, so that it is one inch high on the ground-glass; thus we know that $r = 5$. Next measure the distance between the object and the ground-glass (D), which is found to be 45 inches.

Then $p = 45 \times$ (multiplied by) $5 \div$ (divided by) $6 \times 6 = 6\frac{1}{4}$ inches.
$f = 5\frac{1}{4} \times 6 \div 5 = 7\frac{1}{2}$ inches. Or $f = 45 \div 6 = 7\frac{1}{2}$ inches.
$F = 6\frac{1}{4} \times 6 = 37\frac{1}{2}$ inches. Or $F = 7\frac{1}{2} \times 5 = 37\frac{1}{2}$ inches.
$D = 6\frac{1}{4} \times (5 + \frac{1}{5} + 2) = 6\frac{1}{4} \times 7\frac{1}{5} = 45$ inches.
$r = (37\frac{1}{2} - 6\frac{1}{4}) \div 6\frac{1}{4} = 5$. Or $r = 6\frac{1}{4} \div (7\frac{1}{2} - 6\frac{1}{4}) = 5$.

ELSDEN'S TABLE OF POISON AND ANTIDOTES.

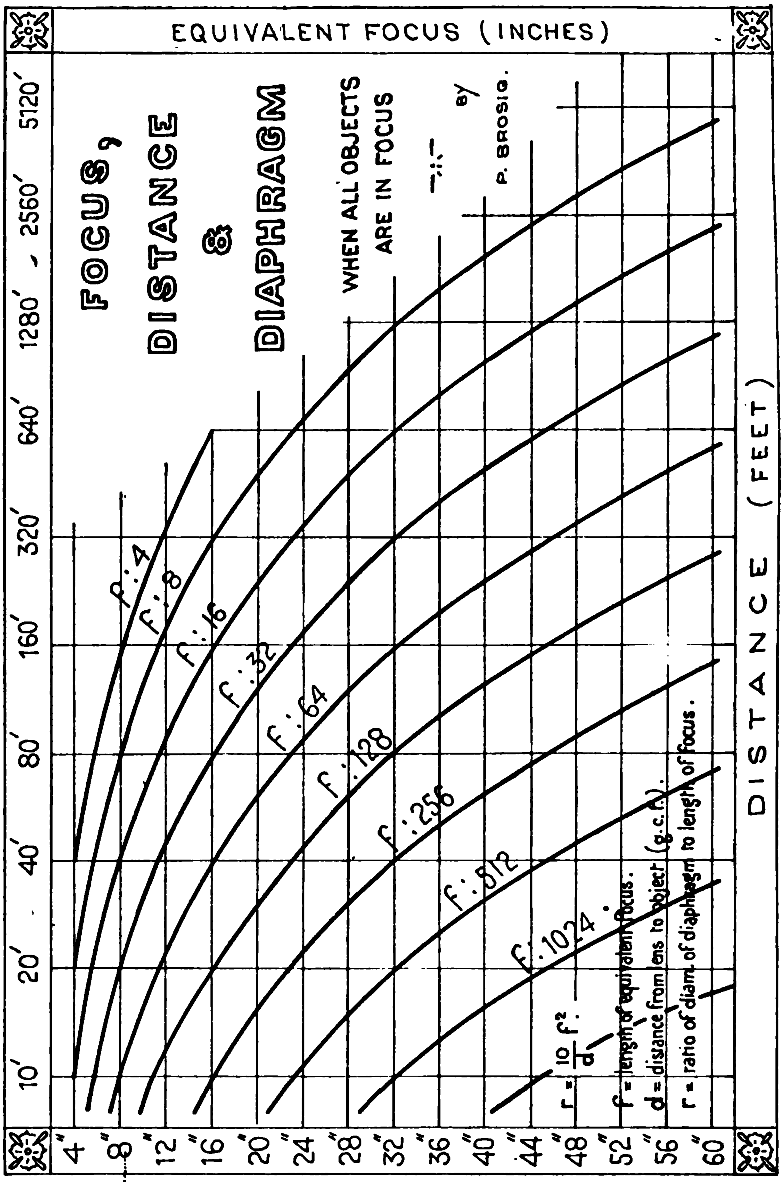
	Poisons.	Remarks.	Characteristic Symptoms.	Antidotes.
Vegetable Acids	OXALIC ACID including POTASSIUM OXALATE.	1 drachm is the smallest fatal dose known.	Hot burning sensation in throat and stomach; vomiting, cramps, and numbness	Chalk, whiting or magnesia suspended in water. Plaster or mortar can be used in emergency.
Caustic Alkalies	AMMONIUM " / POTASSIUM " / SODIUM "	Vapor of ammonia may cause inflammation of the lungs.	Swelling of tongue, mouth and fauces; often followed by stricture of the œsophagus.	Vinegar and water.
Metallic Salts	MERCURIC CHLORIDE	3 grains the smallest known fatal dose.	Acid, metallic taste, constriction and burning in throat and stomach, followed by nausea and vomiting.	White and yolk of raw eggs with milk. In emergency, flour paste may be used.
	ACETATE OF LEAD	The sub-acetate is still more poisonous.	Constriction in the throat and at pit of stomach; crampy pains and stiffness of abdomen; blue line round the gums.	Sulphates of soda or magnesia. Emetic of sulphate of zinc.
	CYANIDE OF POTASSIUM	*a*. Taken internally, 3 grs. fatal.	Insensibility, slow gasping respiration, dilated pupils and spasmodic closure of the jaws.	No certain remedy; cold affusion over the head and neck most efficacious.
		b. Applied to wounds and abrasures of the skin.	Smarting sensation.	Sulphate of iron should be applied immediately.
	BICHROMATE OF POTASSIUM	*a*. Taken internally.	Irritant pain in stomach and vomiting.	Emetics and magnesia, or chalk.
		b. Applied to slight abrasions of the skin.	Produces troublesome sores and ulcers.	
	NITRATE OF SILVER		Powerful irritant.	Common salt to be given immediately, followed by emetics.
Concentrated Mineral Acids	NITRIC ACID	2 drachms have been fatal. Inhalation of the fumes has also been fatal.	Corrosion of windpipe, and violent inflammation.	Bicarbonate of soda, or carbonate of magnesia or chalk; plaster of the apartment beaten up in water.
	HYDROCHLORIC ACID	½ ounce has caused death.		
	SULPHURIC ACID	1 drachm has been fatal.		

ACETIC ACID, concentrated, has as powerful an effect as the mineral acids.

	Poisons.	Remarks.	Characteristic Symptoms.	Antidotes.
	IODINE	Variable in its action; 3 grains have been fatal.	Acrid taste, tightness about the throat, vomiting.	Vomiting should be encouraged, and gruel, arrow-root and starch given freely.
	PYROGALLOL	2 grains sufficient to kill a dog.	Resemble phosphorus poisoning.	No certain remedy. Speedy emetic desirable.

FREEZING MIXTURES.

	Ingredients.	Parts by Weight.	Temperature Produced Starting at 10° C.	Diminution of Temperature.
1	Water Nitrate of ammonia	1 1	—16° C.	26° C.
2	Water Saltpetre Chloride of ammonium (sal ammoniac)	16 5 5	—12°	22°
3	Water Nitrate of ammonia Carbonate of soda	1 1 1	—19°	29°
4	Snow Chloride of sodium	5 2	..	20°
5	Snow Crystallized chloride of calcium	1 2	--	45°
6	Crystallized sulphate of soda Hydrochloric acid	8 5	—20°	30°



This diagram illustrates the relations that exist between equivalent focus, diaphragm and greater conjugate focus in regard to depth of focus. The values herein given are computed for an approximate universal focus (depth of focus = ∞) and are based upon a circle of confusion of 1/120 inch diameter.

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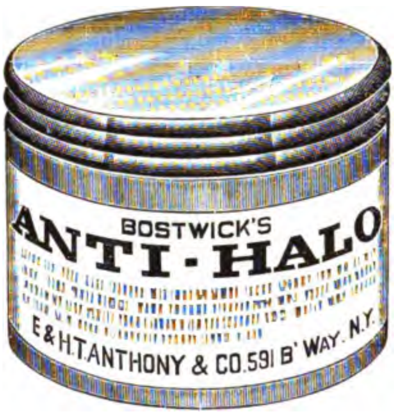

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2A	1½ "	8 "	6½ x 8½	25 00
3A	2 "	11 "	8 x 10	40 00
4A	2¾ "	15 "	10 x 12 or 11 x 14	50 00
5A	3 "	18 "	11 x 14 or 14 x 17	60 00
6A	3½ "	23 "	14 x 17 or 18 x 22	75 00

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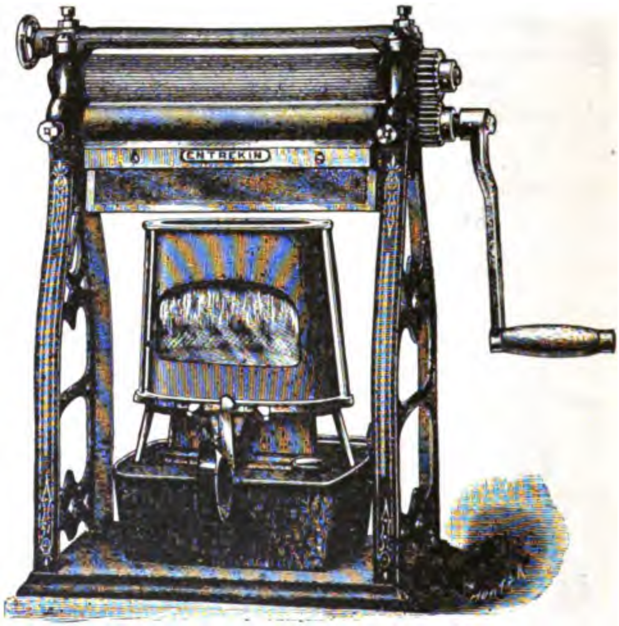

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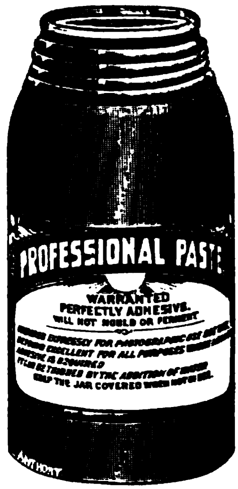

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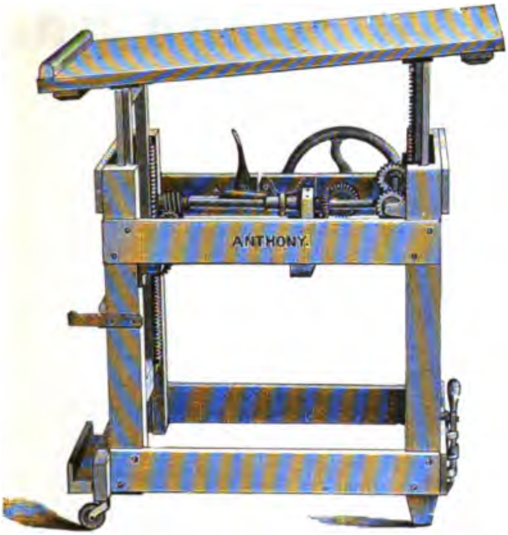

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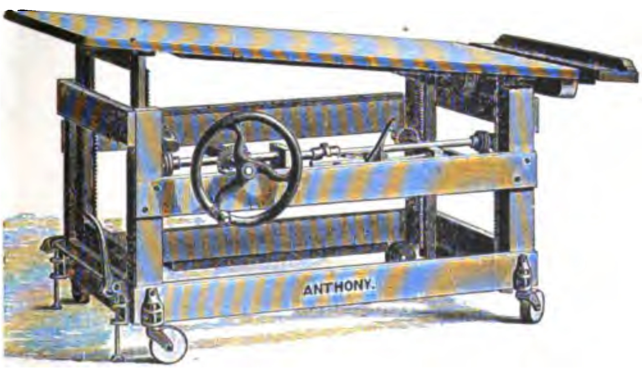

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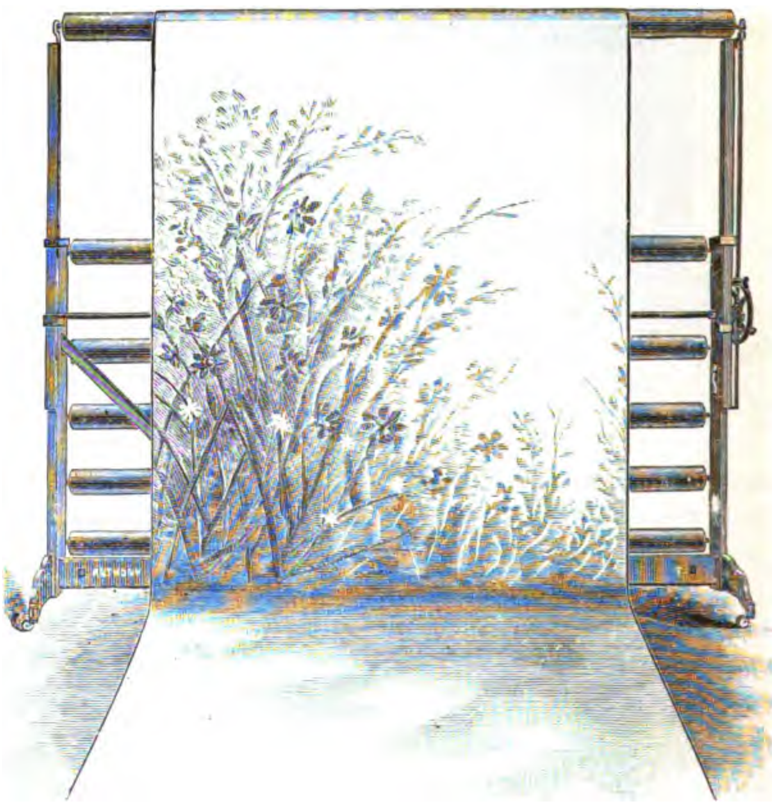

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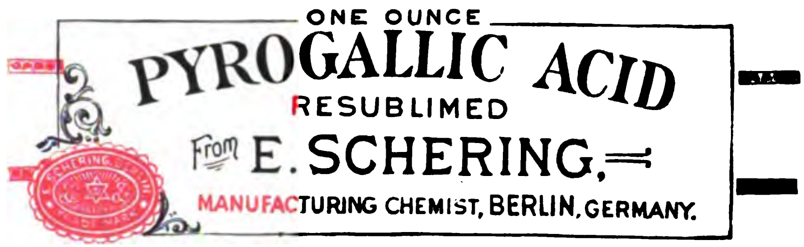

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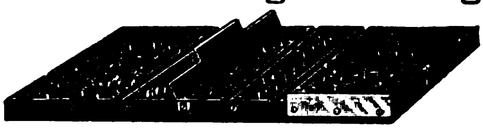

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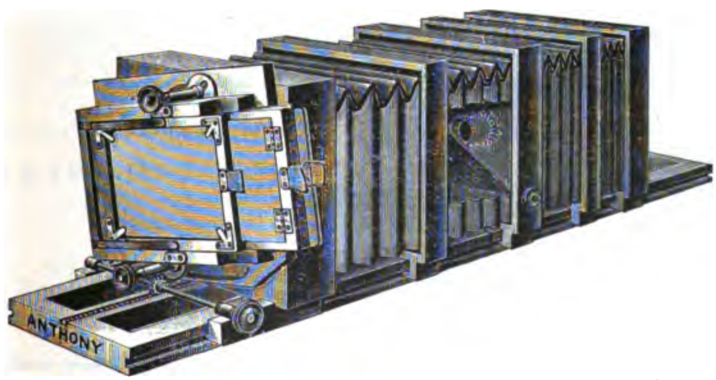

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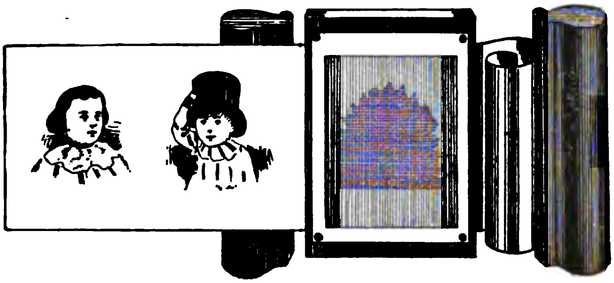

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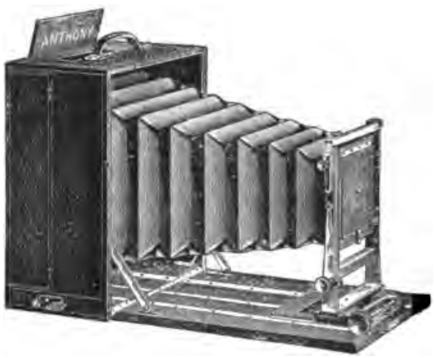

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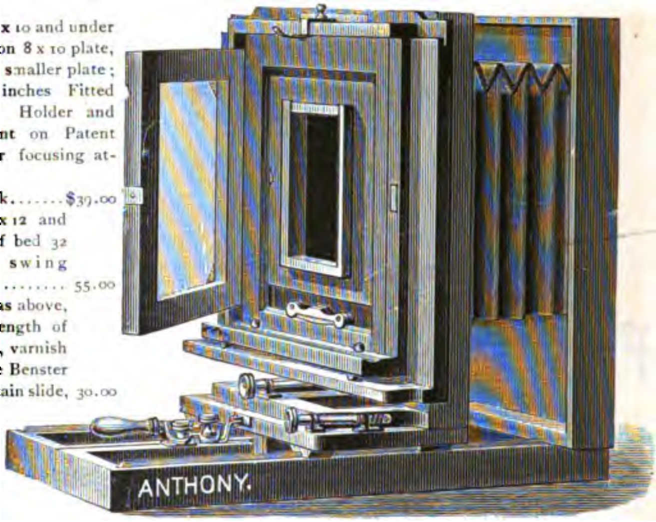

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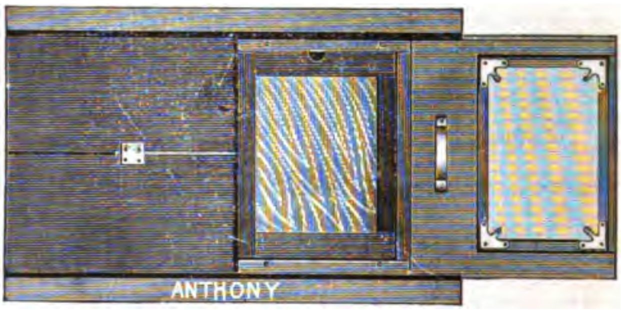

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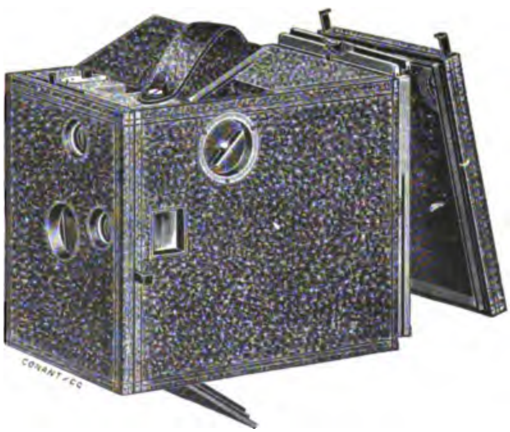

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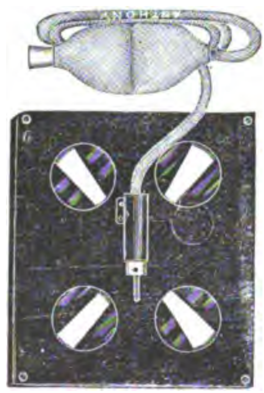

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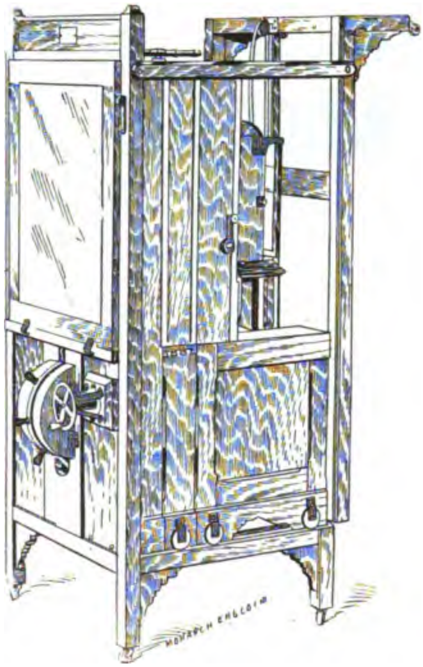
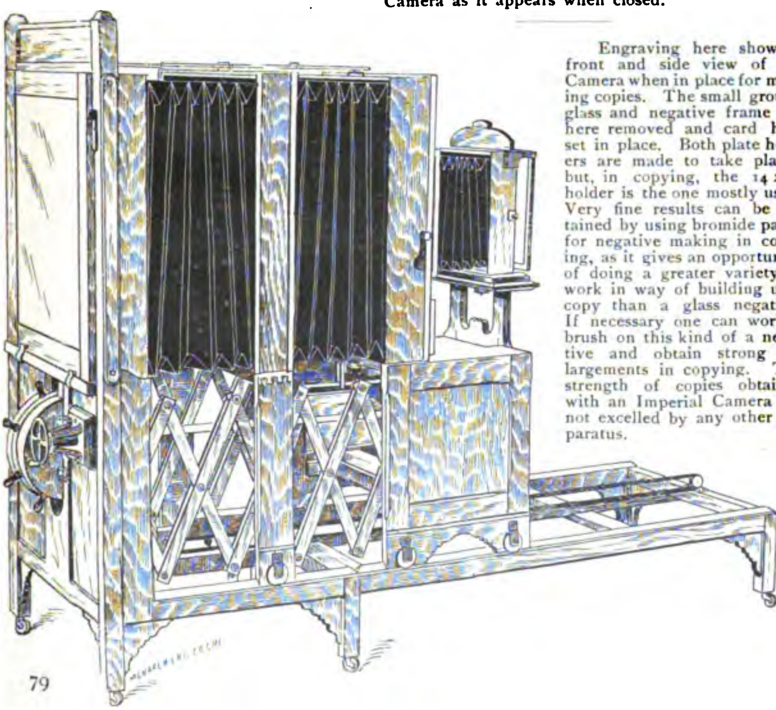


This engraving presents the Imperial Camera as it appears when closed.



Engraving here shows a front and side view of the Camera when in place for making copies. The small ground glass and negative frame are here removed and card hold set in place. Both plate holders are made to take plates, but, in copying, the 14 x 17 holder is the one mostly used. Very fine results can be obtained by using bromide paper for negative making in copying, as it gives an opportunity of doing a greater variety of work in way of building up a copy than a glass negative. If necessary one can work a brush on this kind of a negative and obtain strong enlargements in copying. The strength of copies obtained with an Imperial Camera are not excelled by any other apparatus.

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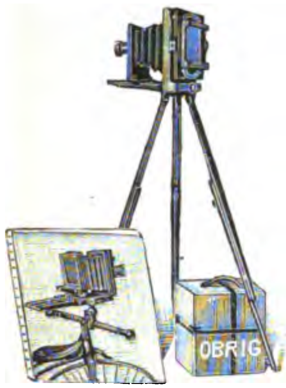

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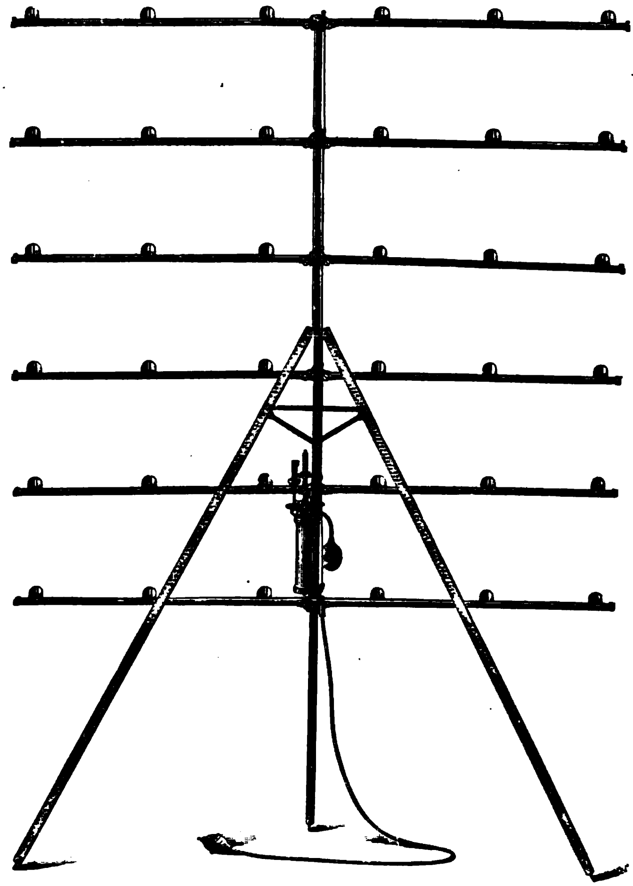

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